RAILROAD GAZETTE

FRIDAY, DEC. 13.

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Contributions.

To Make Red Lines on Blue Prints.

Office of Sooysmith & Co., 2 *Nassau street.*
NEW YORK, Nov. 26, 1889.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Maybe some of your readers will find the following interesting, if they have not already stumbled on or reasoned out the fact. It is a solution for making *bright red lines* on blue prints. To the red aniline ink now used add about 25 per cent. of a solution of carbonate of potash. I used a solution of 60 grains of carbonate of potash to the ounce of water, merely because I happened to have the solution on hand, not because I felt any confidence in the strength of the solution. The action is evident; the carbonate of potash destroys the blue, leaving the red, which appears especially bright compared to the surrounding blue. It would probably be just as good to dissolve a few crystals of carbonate of potash in the ink, as it does not injure the ink for ordinary usage. C. J. BATES.

Trains Breaking Apart.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The new book of rules of the Pennsylvania lines west of Pittsburgh, which took effect Nov. 10, is in general admirable, but the following regulations do not seem to be as explicit as they might be. Rule 103, in regard to the parting of trains while in motion, says: "The front portion will have the right to go back, regardless of all trains, to recover the detached portion, first sending a flagman with danger signals 600 yds. in advance in the direction in which the train is to be backed, and running with great caution at a speed not to exceed four miles per hour. The detached portion must not be moved or passed around until the front portion comes back." The last part of rules 221 and 225 says: "The flagman (who is also the rear brakeman) must immediately stop the rear portion and send forward the most reliable person he can secure to make danger signals until the front portion comes back, while he protects the rear."

With some men the above rule might cause a bad wreck where trains are running five minutes apart. The part of the rule which refers to sending forward the most reliable person obtainable is worded more strongly than the part in regard to protecting the rear of the train; but the real danger is to be expected from the rear, and many trainmen would attempt to carry out the first part of the instructions *before going back*. Don't you think that on the strength of the forward portion having absolute right to come back, and the speed being limited to four miles per hour, with a flagman 600 yds. in advance, this clause is useless and almost dangerous?

TRAIN PARTED.

Tests of the Massey Air Pump.

NEW YORK, Dec. 10, 1889.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Referring to the article which appeared in your issue last week descriptive of the Massey air pump, which this company is now manufacturing, we desire to make prominent some features which we claim for this pump, and which did not appear in that article. We make the following distinctive claims:

First, that this pump will deliver 70 per cent. more air with a given amount of steam than any 8-in. pump now in general use, for in practice an 8-in. steam cylinder is used to actuate a 7½-in. air cylinder; the volume of free air taken into the pump each stroke is only .88 of the volume of the steam used to compress it. In the Massey duplex pump the steam cylinders are each 5 in. in diameter. One air cylinder is 5 in. and the other 7 in. As both air cylinders are filled with free air each stroke, the volume of free air taken in at each is 1.50 of the volume of steam used to compress it. The efficiency of the two pumps is therefore as .88 to 1.50, or 1.00 to 1.70. In other words, our duplex pump will compress 70 per cent. more air per unit of steam than the ordinary 8-in. pump. The average of a series of tests with an 8-in. pump and our duplex pump with two 5-in. cylinders proved that the 8-in. pump required 67 per cent. more steam and a longer time to charge a large reservoir to a given pressure.

Second, simplicity of construction. There are but two sizes of piston and packing rings, namely, 5-in. and 7-in. diameter, while in the standard 8-in. pump there are five sizes, namely, 8-in., 7½-in., 2⅛-in., 2-in. and 1⅛-in. diameter. The steam valve gear is reduced to plain slide valves in a direct line with the piston rods and actuated positively by them. The air valves are simple poppet valves, which seat by gravity while the piston waits, and therefore are not liable to pound themselves to pieces. The steam and air valves are accessible and may be examined by unscrewing plugs without taking down the pump. There are no long pin-hole ports liable to be clogged by bits of scale or other foreign substances.

We note also a typographical error. The article reads: "The greatest resistance would be three atmospheres or 5 lbs., and consequently any steam pressure above 9," etc. It should read 45 pounds and 90 pounds.

EAMES VACUUM BRAKE CO.

Guard Rails and Rerailing Frogs.

TO THE EDITOR OF THE RAILROAD GAZETTE.

You have recently published a novel and in many respects very excellent design of bridge floor as used on the Michigan Central. In a later issue appeared a letter from Prof. Swain asking for specific information of cases in which derailed trucks have taken the wrong side of guard, and in which the rerailing frog has helped to prevent a wreck that would not have been prevented by a good floor without the rerailer (I write from memory). I have hoped to see some further discussion of this important subject. Awaiting that, I will give you my views for what they are worth. They may not be worth much, although I have studied the subject carefully. If any one will help me to correct any errors into which I have fallen, I shall be glad to learn from him.

1st. As to the rerailing frog, I know very well that this device may do its work, and I know of instances in which it has replaced wheels upon the track. At the same time it seems to me that what we want is simply to carry a derailed truck safely across the bridge. Whether it goes across on the rails or not, that is another matter, independent of the bridge. If we make our bridge floor so that a derailed truck will go safely across on the ties, then as regards a rerailing frog a bridge stands exactly on a par with all the rest of the track, and there is no more reason for putting a rerailing frog there than there is on high embankments, or on sharp curves, or at other dangerous places. As for using rerailing frogs at *every* bridge, I certainly should not do it, because I do not think that it is necessary in the great majority of cases. There appears to me to be one objection to the device, and that is this: if the guard rails are not carried across the bridge, the same cause which led to the derailment before the bridge was reached may cause a derailment on the bridge, in which case the truck might get twisted and lead to an accident; while if the guard rails are carried across close to the track rail, so as to prevent a derailment on the bridge by holding the flange, then there is force in the objection that stones, or links, or something else might get caught between the two rails. If the device is used, I think it should be used in a manner a little different from the way in which I have always seen it applied; that is, there should be an incline at the approach to the bridge, the narrow throat where the wheels are put on the rails, then another incline downward, and the guard rails carried across 8 or 9 in. from the track rail. Then any wheel derailed on the bridge would run along between the guard and track rails, and would meet with no obstruction where it left the bridge, but would be put on the track there. But, as I said before, it seems to me that with a good, strong and wide floor most bridges need no further protection. What I would like to know, and, I judge, what Prof. Swain wished to get at, is some instance in which the rerailing device has done its work where it could be shown that a good floor and inside guard rails would *not* have carried the derailed wheels across with equal safety; or some instance in which an accident has occurred on a bridge floor like that recommended by the Massachusetts Commission, in which it could be shown that a rerailer *would have prevented it*. I have never heard of such instances, yet these, I think, are what we need before we can express any very decided opinion, or condemn either arrangement.

2d. As to guard rails. It has seemed to me, in the first place, that if a truck is derailed it should be guided by placing the guard rail where it would be struck by the wheel *between* the rails, since the obstruction of this wheel would turn the truck in such a way as to bring it back to its proper position, and also because such a rail would be struck by the *flange* of the wheel. This, it seems to me, shows that, aside from other considerations, between the rails is the place to put the guard rails. In the second place, since many bridges are not wide enough to allow a derailed truck to go across, if very much out of its position, the guard rails should be brought to a point. Of course this has the objection that a wheel might take the wrong side, if derailed by more than half the gauge. I have never, however, seen any marks on the ties of wheels off the track by as much as half the gauge, except where the train has parted very soon, and *not* at bridges; and it is my opinion that as long as a train holds together a truck will be kept from getting so far off the track. If it has already got so far or farther, an accident will be very likely to happen at a bridge, guard rails or no guard rails, since the derailed car will either strike the trusses or the guard timber or be twisted about in some way or other. Of course this is a matter of experience, and here again what we want is a record of actual instances in which wheels have been off the track by more than half the gauge, with a statement of what ensued. The argument is made that if a truck is derailed by more than half the gauge it will take the wrong side of the point; but it may be shown from actual measurement that if a truck were derailed by that much either the outer wheel would strike against a heavy 12 × 12 guard timber (bumper post) or against bridge ties, whose tops are 6 or 8 inches above the surface of the ballast, or else that the car would strike against a truss; and this, it seems to me, is a pretty effectual answer to the argument.

You may perhaps have observed that the Massachusetts Railroad Commissioners have called attention to the fact that the objection referred to against bringing inside guard rails to a point may be obviated by placing outside guard rails extending beyond and, if desired, considerably beyond the point of the inside guard rails, and flaring as far from the track rail as may be thought necessary; at the point of the inside guard rails, the distance between the inside and outside rails being somewhat less than the gauge. It seems to me that this would make the safest form of bridge approach, and it is used on one road in Massachusetts. ENGINEER.

The Urgent Necessity for the Block System.

TO THE EDITOR OF THE RAILROAD GAZETTE:

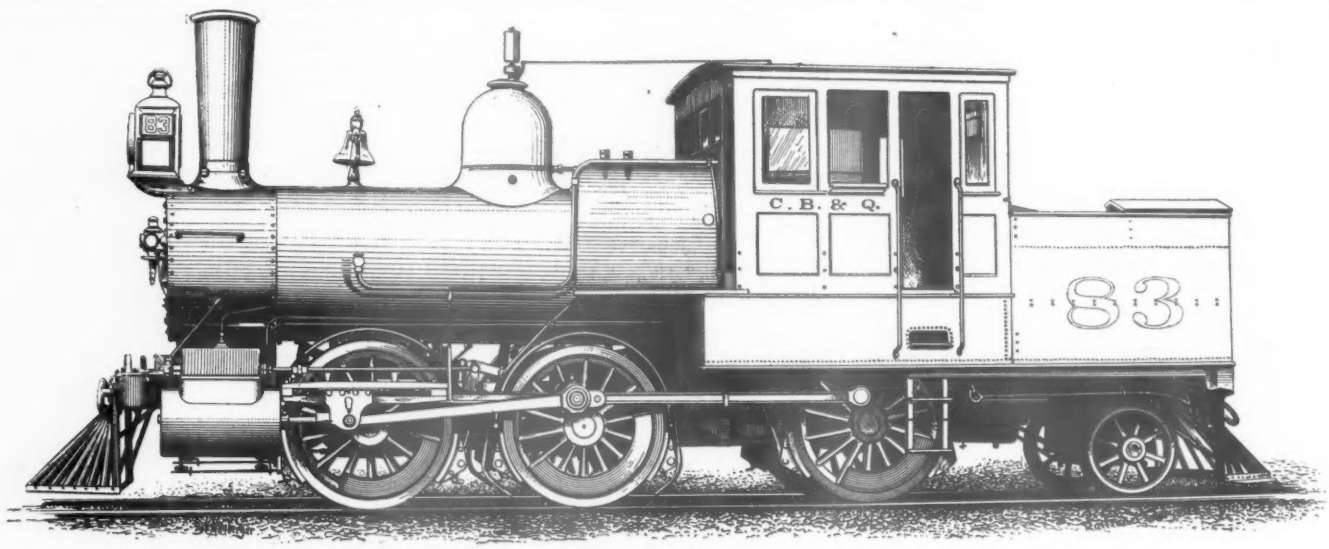
The article in your issue of Nov. 1, concerning "The Time Interval between Trains," should attract much attention, taking as it does for its text the Palatine Bridge collision. (Why call it an accident?) Your moral would be of the greatest use to the railroad service, if, as the Pope said to Father Tom, "it were drawn with a little more distinctiveness."

Railroading in this country is about 60 years old and the prevailing methods with regard to the running of trains at the present time are substantially what they have always been. Our train service has grown from nothing up to its present large figure, and we may judge somewhat from the past as to what the future will be. But have our methods and their results improved with the growth of our business? Our rules have multiplied with the number of accidents; but have the accidents decreased in the same ratio? *If* trains would keep the distance apart which each individual General Manager thinks is safe for his road; *if* the possibly lazy or tired-out flagman would jump off and run back as hard as he can as soon as his train slows up; and *if* sleepy train dispatchers and sometimes not overintelligent operators would not make mistakes in giving orders, then we might reasonably expect that the making of rules would prevent collisions.

The Railroad Commissioners of the state of New York recommend that the time limit be increased to ten minutes. It seems to me that a perusal of the table of distances given in your before-mentioned article would have shown this to be quite inadequate. I must also say that I regret much that they did not take a more positive stand with regard to the adoption of an absolute block system.

"Transportation" in your issue of Nov. 15th adds his mite to the already cumbersome rules by the suggestion of three sections to amend Standard Rule 31, for the government of flagmen in the use of fusees. He also says that in his opinion "the fusee signal is the most reliable for night and foggy weather." Not a word does he say about a semaphore or the block system. How men can clear up wrecks and investigate the causes of them, year after year and month after month, without recognizing the fact that there is something fundamentally wrong in their methods, I do not see.

Look at the simple semaphore arm displayed in front of a station—horizontal when the block ahead is occupied and inclined at an angle of sixty degrees when clear. What can be simpler or more comprehensive than that? By the use of a small arrangement known as the electric slot in connection with a closed rail circuit, the operator in the station is prevented from lowering the semaphore when the block is occupied. This last device entirely prevents all accidents due to mistakes of train dispatchers and operators; misunderstanding of rules and orders; carelessness or laziness on the part of flagmen in the use of torpedoes, lamps or fusees, and the misplacing of switches—for if the electric device fails (which is most unusual) the signal of itself goes immediately to danger. The use of an absolute automatic block system in connection with a closed rail circuit prevents all train accidents, except the deliberate disregard of a fixed signal by an engineman; the breaking under the train of a part of the track or equipment, and the falling onto the track of a tree or an animal, or some such obstruction. Even the first of the three causes may be prevented by



SUBURBAN PASSENGER LOCOMOTIVE, CLASS I.—CHICAGO, BURLINGTON & QUINCY RAILROAD.

the addition to the signal post of a small arm which works in connection with the semaphore, and in case an engineman attempts to pass a signal when it is in the danger position will automatically set the brakes on the train. The dangers due to broken rails, misplaced switches, disregard of orders, and, in fact, all the most frequent causes of disaster to railroad trains are entirely done away with. And what is the usual reason given by managers for not adopting some such method? The expense. This objection, I should think, could be met by the following question: How much is a human life worth in dollars and cents? When determined, multiply by the number of lives sacrificed in a year through the above-mentioned causes, and I am quite sure the result will be in favor of a positive block system.

The question as to whether traffic is delayed or expedited by the use of a block system has passed the stages of discussion, for it has been incontestably proven that, by locating the signals at proper distances apart, to be determined by the speed and number of the trains, the traffic may be indefinitely increased. I contend that this is not a question of money, but of the safety of human lives; and I have intentionally left out of this discussion any estimate of cost, because, although I firmly believe that railroads can be operated under the block system at less expense than under the present no-system, our immediate necessity is for something which will render the operation of railroads less dangerous to their patrons and employés. An absolute block system is required by law in England, and is, therefore, in almost universal use in that country, and is, moreover, under the supervision of the National Board of Trade. In the United States I know of not one single road which is operated under a positive block system. There is a very short railroad in the East which is completely equipped with a system which is operated in connection with a time limit (known generally as the permissive block system); but even this is singular, for the roads even partly equipped with the permissive block are very few. I have yet to hear of the road which has ever blocked under any system and then abandoned it. It is simple, safe and susceptible of the greatest expansion. It requires no special rules, because no special cases can occur. It may be worked in connection with, or independent of, an interlocking system, as circumstances may direct. A danger signal means *stop*. A clear signal means go ahead until another signal is reached, and, furthermore, it involves no question of standards or interchangeability between roads.

It is a delicate fiction on most lines that a man who asks employment of a railroad company is alone responsible if he be injured while on duty, and that he should not accept the work unless he is willing to assume the risks. But I think most people will agree that every killing or injuring of a person on the line of a railroad, whether that person be passenger or employé, simply because the managers of that road have not taken some precaution which would have prevented that and other injuries from a like cause, is a stigma on their management and ability to fulfill their duties. When I think of the horrible death of Howard Fry, caused by a rear collision; of Webster Wagner, killed at Spuyten Duyvil, and of the narrow escape of H. B. Ledyard and M. E. Ingalls in the Palatine Bridge collision, I am amazed and astounded that railroad managers do not take some means better than they are using for their own protection, if not for the protection of those under their charge. Let me ask with how much confidence Mr. Ledyard will hereafter ride on the rear end of the first section of a New York Central express train, even though their time limit be increased to ten-minute intervals, according to the recommendations of the New York Railroad Commissioners.

The public is rapidly awakening to the fact that traveling on railroad trains is not as safe as it might and should be, and railroad managers will best serve their own and the interests of their companies by recognizing this and being governed accordingly.

Luke Forward.

Class I Locomotive—Chicago, Burlington & Quincy.

By a full-page inset and other illustrations, we show this week the new class "I" suburban locomotive of the Chicago, Burlington & Quincy Railroad. This locomotive is worth more than a passing notice, because of the novelty in its general design and the originality shown in the arrangement of some of its details.

The following are the general dimensions:

Machinery:	
Cylinders	17 in. dia. × 22 in. stroke.
Steam ports	1¼ in. × 16 in.
Exhaust ports	2⅝ in. × 16 in.
Steam pipe, sectional area	15.9 sq in.
Valves—Allen-Robertson:	
maximum travel	5 in.
lap, outside	¾ in.
lap, inside	0 in.
lead, full gear	1-32 in.
Link, radius of	3 ft. 4 in.
Centres of cylinders, transverse dist. apart	7 ft.
Centres of valve stems, " " "	6 ft. 5 in.
Centres of frames, " " "	3 ft. 11 in.
Main crank pins	5 in. dia. × 5⅝ in. long.
Cross-head pin	3 in. dia. × 3 in. long.
Main side-rod pin	5¼ in. dia. × 5 1-16 in. long.
Front and back side-rod pin	4 in. dia. × 3½ in. long.
Boiler—Belpaire type:	
maximum steam pressure	160 lbs.
inside diam. smallest ring	51¼ in.
fire box, length	6 ft.
" width	3 ft. 6 in.
" height	4 ft. ⅛ in. and 4 ft. 9¾ in.
water spaces	3½ in.
dome	2 ft. 4 in. dia. × 2 ft. 4 in. high.
material	steel.
Thickness of sheets:	
shell	⅜ in.
top, sides and back of fire box	⅜ in.
tube sheets	½ in.
Number of tubes	196
Outside diameter of tubes	2 in.
Length of tubes	11 ft.
Thickness of tubes	No. 12 B. W. G.
Heating surface:	
Fire box	84 sq. ft.
Tubes—outside	1,126 sq. ft.
Total	1,210 sq. ft.
Total area of tube opening	3 4-10 sq. ft.
Grate surface	21 sq. ft.
Tank:	
Material—steel	3-16 and ¼ in.
Capacity for water	1,600 gals.
" for coal	2½ tons.
Weights:	
On front drivers	30,000 lbs.
On middle drivers	32,000 "
On back drivers	32,000 "
Total on drivers—maximum	94,000 "
On truck	19,000 "
Total weight of engine in working order	113,000 "

This locomotive, it will be noticed, is almost exactly, in its general features, such as wheel bases, truck, etc., like the class "H" engine used on the same road, but with the truck placed at the rear. The illustrations show clearly the ruling dimensions and nearly all of the details, therefore it will be necessary only to point out peculiarities in construction and novelties in design which might otherwise escape notice.

The boiler, which is of the Belpaire type, is carried, not upon links, as is customary, but upon sliding pads, clearly shown at the front, sides, and back of the fire-box. The front and back pads are formed on the ends of braces, which extend across from frame to frame. The main frames are 4 in. wide, and the top rail back of the middle driver is dropped 7½ in. in order to increase the depth of the fire box under the tubes. The back frame which carries the tank is made of wrought iron 2 in. thick and 8 in. deep—rectangular in section.

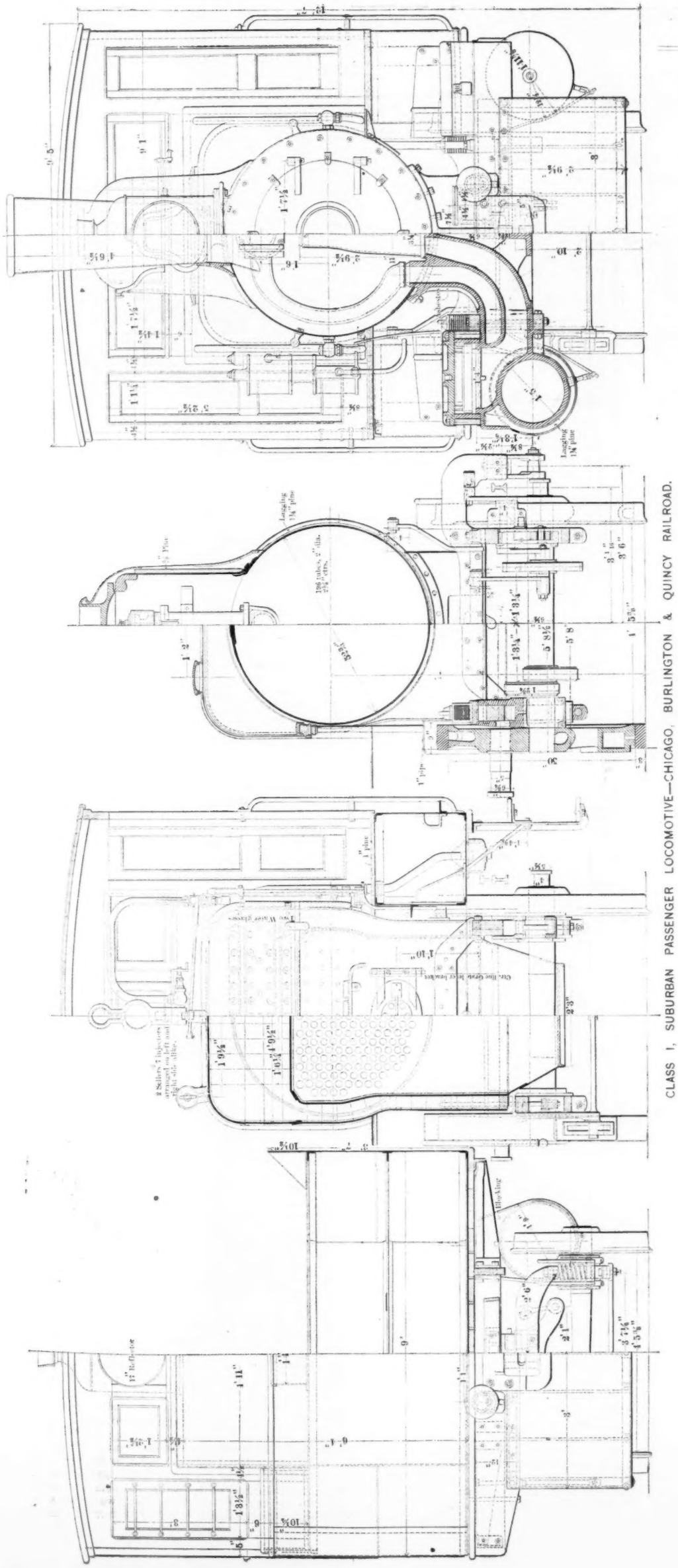
The tank extends under the cab, but a space is left for the fireman to stand below the main floor of the cab on a foot plate just above the main frame, in order that he may conveniently reach the fire door. At this point the space is rather cramped, and only a short shovel can be used. The fire box is supplied with a brick arch carried upon lugs.

Considerable attention has been devoted to the proper location of the cab mountings, and it will be noticed that the levers and handles are all within easy reach of the engineer when running either forward or backward. The throttle stuffing box is placed in the dome sheet, and through it the throttle rod runs to a tapered joint connection between the dome and the cab, thence to a bracket at the throttle lever. The coal is carried on top of the tank and in the space between the legs, where it is held by coal boards slipped into angle iron brackets on the sides of the tank, shown in the side elevation. To prevent the coal from entering the cab and to increase the space available for the fireman to move about, a sheet-iron shield is placed as shown at the back of the cab. The headlight is placed within the cab, in order to prevent its being injured when coal is taken on, its top projects through the roof and its glass face comes just outside of the cab back sheet. The cab is made of wood, but it would seem that an iron or steel cab would be better for this class of engine, and probably on future engines sheet metal will be used to a greater extent. The cab handles and steps deserve particular notice, as they are sufficiently long and so well spaced as to prevent as far as possible any danger of the engineer or fireman missing his hold. The step which is made by a recess in the tank is rather ingenious. The sand box finds itself in a most peculiar location. Its presence could never be noticed by a cursory exterior examination. It is placed just ahead of the wagon top and forms an extension of the same. The pipes therefrom lead both to the front and back sides of the main driver.

The dome casings on this locomotive have a steel centre and a cast-iron top and base with invisible joints, as shown in the end elevation. The front headlight brackets are of a new type; they are made of wrought iron and weigh about one-fifth as much as the cast-iron ones ordinarily used. On the smoke box will be seen a convenient handle for the engine men. The cylinder head casings are exceptionally thin. In this case they are made of cast brass, but in the future will be made of pressed steel. The pilots are of iron angles made short in length, in order that they may not interfere with the trucks of passenger cars to which the locomotive is coupled.

The driver brake arrangements are particularly good. Two cylinders are used in order to reduce the complication of levers and to prevent interference with the ash-pan dumping arrangements, which are shown in the side and end elevation. One of the cylinders is mounted on the left-hand side in front of the cylinder saddle, and is connected directly to a bell crank, which is also mounted on the cylinder saddle on the under side. This forms a most rigid and admirable connection between the two without the addition of braces or supports. The other cylinder is secured directly to the engine frame under the tank, and the lever fulcrum is attached to the radius bar cross tie; therefore no additional parts or braces are required to carry either the cylinders or the fulcrum. The details of the brake arrangements are clearly illustrated by the engraving.

Among other peculiarities are to be noticed the main rods, with a solid end and bushing for both the cross head and the crank pin. The parallel rods are fluted. The front and back draw heads have Janney (Master Car Builders' standard) vertical plane couplers, this coupler being the standard adopted by the Chicago, Burlington & Quincy. The guides are fastened to the guide yoke by two bolts instead of one large one, as in most such designs. The reverse-shaft arms have forked ends, the same as those used on the class H engine. This construction has given most excellent results. The injector checks are fastened to the boiler by flanges. The air reservoirs are under the tank on the right-hand side and securely fastened by iron straps and held in position by wooden blocking. The ash pan has two openings in the bottom to assist in the ready removal of the ashes.



CLASS I, SUBURBAN PASSENGER LOCOMOTIVE—CHICAGO, BURLINGTON & QUINCY RAILROAD.

This is an essential point with suburban engines making frequent trips. The joint between the crown sheet and the fire-box sides, as shown in the cross section, is worthy of notice as being almost an essential construction with the Belpaire radial stay boiler.

The equalization of this engine differs from that of the class H from which it was derived. In this type the three drivers on each side are equalized together, and the truck is independent, while in the class H the two rear drivers are equalized together, and also the front driver and the truck. It will be noticed from the side elevation that at the rear of the back equalizer there are two coil springs ingeniously mounted in a manner which requires but little space, and yet seems highly serviceable. Contrary to the general custom, satisfactory provisions are made for oiling the rear driving box through large holes in the equalizer. The careful reader will notice other peculiarities worthy of attention.

The results of nearly three months' trials of this engine in hard suburban service have brought out no defects except a few minor ones, perhaps in workmanship or convenience in manipulation, all of which were easily remedied. The steam distribution at first was not quite satisfactory, but has since been adjusted to suit the requirements of suburban service. The economy in fuel and water consumption shown thus far by this locomotive is much superior to that of the locomotive previously used in this service, and it is expected that this type of locomotive will become a standard for suburban and possibly for switching service.

Trespassers on Tracks and Trains.

"An unknown man found dead, probably struck by some passing train during the night." Such is the message that is constantly being sent to the superintendent of a railroad in this country. "Walking on the track and killed by a freight train." How often do we read that in the newspapers! And then we turn to the stock reports, to the athletic news, political gossip, etc., and think no more of the poor, nameless tramp buried in Potter's Field. The reports of the State Railroad Commissioners give annually the numbers of "trespassers" killed on the railroads of the state. Occasionally a few words in their report call attention to the increasing dangers of grade crossings, and the laxity of public opinion in regard thereto, and there the matter rests for another twelvemonth. If a railroad manager gives serious thought to this subject and makes an attempt to diminish this evil on his road he is confronted at once with the greatest difficulties. First, the entire alignment and construction of the road will in many cases require alteration. Railroads in this country have been built with the idea of producing a road to connect two given points at the least cost consistent with safety. Directness and easy gradients have been the first considerations. "Get the road built first, and attend to details afterward"! has been the demand. The result is that there is not a railroad in the country to-day that can compare in regard to excellence of permanent way with the railroads of Great Britain and the Continent of Europe. Nor is there a railroad in the country, with but very few exceptions, that has been laid out and built with a view to avoiding grade crossings.

Then, too, our stations are almost invariably located near a street or highway crossing, and are open to the public on all sides. A manager may see that his road is properly fenced. He may put flagmen and gates at highway crossings, and warning notices to the public forbidding trespassers; but let him attempt to thoroughly fence in his stations, and in many cases he will find it necessary to entirely reconstruct the stations and its approaches, and then he will meet the determined opposition of the local authorities and of the patrons of the road as well.

The average American is quick, alert, ready in any emergency, accustomed to take care of himself. He resents any interference by others, is impatient at any restraints on his freedom. He does not take kindly to any system of fences and gates. So that oftentimes our railroad manager finds public opinion all against him. It is true we have a law on our statute books making it a misdemeanor for any one to walk on a railroad track or to jump on or off any railroad car while it is in motion. But if any one is arrested for the former offense the police magistrate will invariably dismiss the case without a word. And in the case of a trespasser jumping on or off a moving train, if a railroad officer attempts to make an arrest and by any chance the trespasser is hurt, no matter what his negligence, the chances are ten to one that suit for damages will be brought against the railroad company and heavy cost follow.

This is but a bare outline of the facts. The picture is not one whit overdrawn. The danger is real and constantly increasing. The public are too self-confident, too impatient of restraint, too indifferent. The remedy will only be found in an awakened public sentiment. The evils of location can only be done away with gradually. One by one the grade crossings will disappear, the stations and their approaches will be fenced and protected. To this end there should be, *first*, a law that no *new* grade crossing, either for public or private use, should be constructed, excepting only in case of absolute necessity, and then only with the approval of the State Board of Railroad Commissioners; and next, such a state of public opinion should be aroused that trespassing on a

track or getting on or off a moving train should be *treated as a misdemeanor*, the laws enforced by those paid by the state to enforce them and the *offenders punished as such*. Then, and not till then, will there be an end to the slaughter which is increasing day by day, and which we now regard with so great indifference.

* * *

Hawthorne Freight Yard, C., B. & Q. R. R.

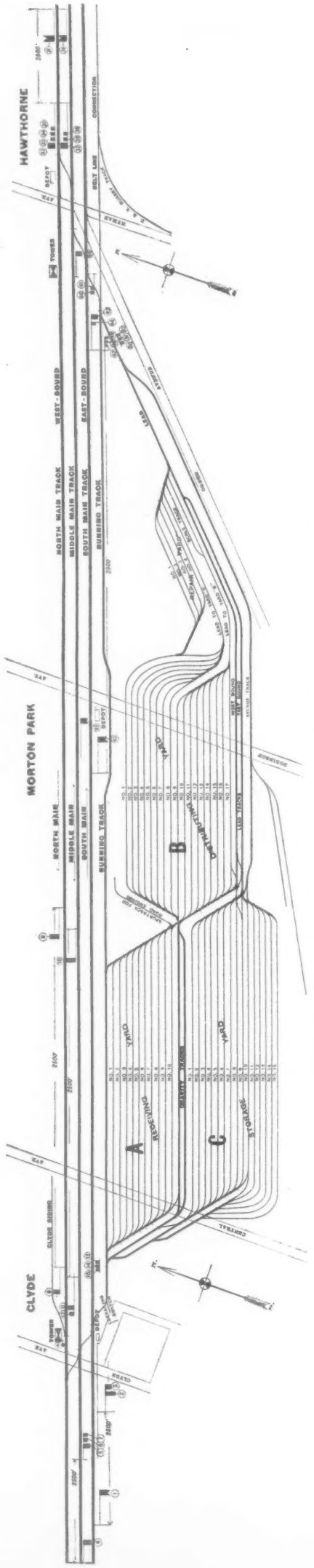
The accompanying diagrams show the new freight yard of the Chicago, Burlington & Quincy, located between Clyde and Hawthorne stations, seven miles out of Chicago. It is on the south side of the main track, and is intended to be used exclusively for eastbound business, the cars, except where there are full trains of live stock or other freight for the Union Stock Yards, being taken from Hawthorne by transfer engines to the various delivery points for local distribution and for connecting roads in various parts of the city.

The cut across the top of the page i a plan of the yard, a number of the intermediate tracks being omitted, however, for the sake of clearness. The other illustration is a copy of the diagram furnished to employés with the book of instructions. In this the scale is distorted so as to admit of showing the yard on a sheet of handy size, but lengthwise of the cut (for the main tracks) it is in true proportion, and is about 800 ft. to the inch, a slightly larger scale than that of the plan.

The yard is divided into four divisions, A, B, C and a repair yard. Yard A consists of 10 receiving tracks, holding 50 cars each, and two gravity tracks. The gravity tracks are 1,800 ft. long. Beginning at the west end they rise at the rate of 13 ft. per mile for 900 ft., are then level for 200 ft., and thence descend 25 ft. per mile for the remaining 700 ft. The general grade of the yard is very slightly descending to the eastward. Eastbound trains enter this yard at Clyde, the engines running through on to the spur track north of the yard B, and backing up through the ladder to the running track (adjoining the main tracks). The caboose is run upon this running track by a flying switch as the train comes in. The engine and caboose then proceed on the running track to Hawthorne, where they take one of the main tracks for the old terminus at Western avenue.

Yard B consists of 17 tracks, the first 7 holding 35 cars and the rest 40 cars each. Trains for the different connecting roads and delivery points are made up in this yard from the gravity tracks in yard A. The number of places to which cars are to be taken is so large that the tracks are none too numerous, and the rules are so arranged that when any traffic, as, for instance, lake grain, falls off, the track allotted to it is at once utilized for further subdividing the classes of cars. Yard C is for storage, and consists of 15 tracks holding 50 cars each. Uninspected grain is held here. The repair yard, located east of B, consists of four tracks holding 15 cars each. One track is reserved for perishable and important loads. From near the east ladder of the repair yard westward to the entrance to yard C there are two lead tracks, one being used for westbound and the other for eastbound movements.

The tracks are spaced 12 ft. apart between centres There are interlocking signals, as shown, at the connection with the main tracks both at Clyde and Hawthorne. The total capacity of the yard is about 2,000 cars.



FREIGHT YARD, HAWTHORNE, ILL.—CHICAGO, BURLINGTON & QUINCY RAILROAD.

Signals and Signaling.

At the meeting of the New England Railroad Club at Boston, Dec. 11, Mr. R. H. Soule, of the Union Switch & Signal Co., delivered an interesting address on the above subject, from which we make extracts below.

Beginning with a brief historical sketch of the art in this country, with allusion to the important features inherited from English practice, Mr. Soule continued:

The semaphore has been referred to as the best form of visible signal. This is certainly true for all signals that are approached at high speed, and must be seen from a distance. Custom has prescribed that home signals should be painted red and distant signals green, although at least one large system in the West has adopted yellow as the standard color for all semaphores; the claim being that the semaphore is merely a position signal, and that therefore it may be of that color which will be most effective, and will make it visible from the greatest distance under adverse conditions. It may be confidently stated that when other forms than the semaphore are used as high-speed signals, the reason lies either in the desire to use a cheaper signal, or in the fact that the motive power used to work the signal is not sufficient to overcome the inertia of the semaphore in starting or to resist its momentum in stopping. It is for this latter reason, probably, that the semaphore is not used where the propelling force is a weight, which is made active through the instrumentality of an electric current and an electro-magnet. This applies principally to high-speed signals; for low-speed signals to govern shifting operations, or what are known as reverse movements, it has hitherto been customary to use a low down disc signal, commonly termed a pot signal; but more recently there is a marked tendency towards the use of dwarf semaphores for this purpose. The almost universal custom in this country is to hang the semaphore blade so that it will point to the right when viewed from an approaching train which it governs. The Boston & Albany is the most notable exception. Some effort has been made to secure the successful introduction and use of position signals by night. The Boston & Albany accomplishes this by the expedient of equipping each semaphore signal with three lights, so connected that when the blade is in the horizontal, or danger, position, two lights, in the same horizontal line, are displayed, while with the blade hanging down, in the clear position, two lights, in the same vertical line, are displayed. More recently, on other roads, illuminated semaphores have been devised and introduced.

Referring to compensators and the difficulties incident to their use, the speaker said:

In general they were expensive, and sometimes dangerous, as when a certain one of the two wires broke, in which case the signal might be left in the clear position; it subsequently developed that with two wire connections it was entirely practicable to omit all automatic compensating devices, and such is now the very general practice. Both wires are fitted with adjusting screws, which need to be used only between extremes of temperature; ordinary slight variations of temperature result in no movement of the signal blade, as both wires are affected equally; neither are the wires thus subjected to any undue strains; in their natural condition they are full of kinks, which give and take enough to more than accommodate the alteration of length due to changes of temperature such as occur in practice.

The principal of preliminary interlocking was formulated as follows: "A lever which is to lock certain levers and release certain other levers must complete all its locking functions before the beginning of its stroke, and must not accomplish its releasing or unlocking functions until after its stroke is completed." Mr. Soule continued: The spring catch affords the means by which it is possible to meet these conditions, and it is now invariably used to actuate the interlocking mechanism; this is common to all successful machines, although the means by which it is accomplished may differ. The following original rules for interlocking were formulated in 1876, and are believed to be sufficient for present guidance.

I. Each home-signal lever, in that position which corresponds to clear signal, must lock the operating levers of all switches and switch-locks which, by being moved during the passage of a train running according to that signal, might either throw it from the track or divert it from its intended course, or allow another train (moving in either direction) to come into collision with it.

II. Each lever so locked must, in one of its two positions, lock the original home-signal lever in its danger position; that position of lever being taken which gives a position of switch, or switch-lock, contradictory to the route implied by the home-signal, when clear.

III. Each home-signal lever should be so interlocked with the lever of its distant signal that it will be impossible to clear the distant signal until the home signal is cleared.

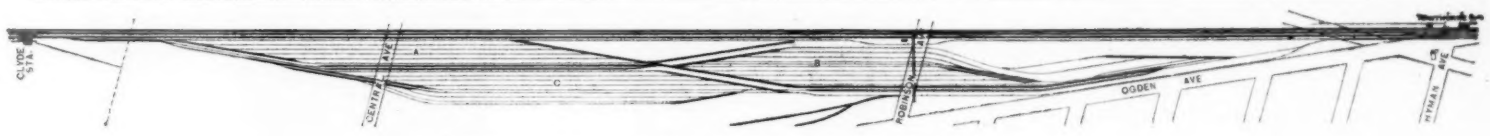
IV. Switch and lock levers should be so interlocked that crossings of continuous tracks cannot occur, where such crossings are dependent upon the mutual position of switches.

V. Switch levers and their lock levers should be so interlocked that the lever operating a switch cannot be moved while that switch is locked.

When these rules are followed in practice their mutual bearing, one on another, becomes evident, and it is found to be unnecessary to locate a separate locking dog for each locking process referred to. The practical process of making an interlocking chart becomes an instinctive matter with those who are habitually engaged in that class of work.

Even the excellent Saxby & Farmer machine has some features which are susceptible of improvement. The Union Switch & Signal Co. have been required to carry 500 different patterns of locking dogs to meet all the cases of exceptional and special locking which have occurred in their practice. By the recent introduction of what is known as tongue-locking, which may be used as an auxiliary to the Saxby & Farmer system, the number of such patterns has been reduced from 500 to 20. The advantage thus gained is being still further pursued, and the company is about ready to introduce a new interlocking machine, from which the old Saxby & Farmer flops and locking dogs have been eliminated. The new interlocking mechanism revives the use of bars with beveled faces, as in the Stevens system, but under such radically different conditions that the rapid wear which characterized the Stevens locking, and seriously impaired its efficiency, cannot occur. The working parts of the interlocking mechanism of the new machine are all of wrought iron, steel, or malleable iron, and their durability thus assured.

The tendency of recent practice is toward still greater concentration than had been effected by the mere assembling of switch and signal levers; this applies to the track work as well as to the machine and the connections. A terminus which has been planned with reference to its control from an interlocking station will, in general, be found equipped with lead tracks of high frog angle and with double slip switches. . . . Originally, separate levers were used for each switch, lock and signal; at the present time it is common practice to work the two switches of a crossover with one lever; if movable frogs are used, they may be moved by the same lever; it is now usual to move a switch, its lock, and its detector bar by a single lever; as the lock bolt must be withdrawn and detector bar reversed before the switch is shifted, and as both must be restored to normal position again after the movement of switch is completed, special and ingenious mechanism has to be employed to accomplish this result from the single stroke of a single lever. A home and a distant signal are often worked by a single lever, a special device being introduced into the connections, which insures the clearing of the home signal before the distant signal is cleared. By holding the lever at midstroke the home signal may be held at clear and the distant signal held at caution. In working signals the introduction of selectors has contributed toward greatly reducing the number of levers required for the operation of an interlocking plant. The principle of the selector is this: Given a group of signals, only one of which can show clear at a time, then only one lever in the interlocking apparatus need be provided for the operation of those signals; the line of connections from the working lever is led out to some convenient point in the direction of the signals, and there terminates in the selector; from the selector run independent lines of connection to the several signals; the function of the selector is to engage the lever connection with one or another of the signal connections, and this is automatically accomplished by the connections to the several switches involved, alongside of which switch connections the selector must be located. The result is, that when the lever is pulled, that signal is cleared which corresponds to the setting of the switches; in fact, the selector is an auxiliary interlocking apparatus; its application to the connections of a group of signals reduces the number of levers to be handled in the interlocking station, but in connection with what are known as indicators, the selector may be utilized to reduce the number of signals themselves. An indicator is a device by which one of several divergent routes implied by a signal is designated and defined; indicators generally consist of a set of discs



HAWTHORNE YARD.—C., B. & Q. R. R. Approximate Scale, 850 ft. = 1 in.

located just below the signal blade, and numbered to correspond to the several routes. When the signal is at danger, the indicator discs are concealed behind a screen; when the signal is cleared, that disc which designates the route prepared by the switches is elevated into view and brought into range with a lamp placed immediately behind, so that the number on the disc may be observed either by day or night.

The utilization of these several expedients, such as the switch and lock movement, the home and distant signal movement, the selector, and the indicator, have made it possible to effect a large reduction in the cost of interlocking plants. Two instances from recent practice will illustrate this. The interlocking apparatus at the Grand Central Station in New York City, as rearranged in 1887, comprised 116 levers. Within two years the change in terminal arrangements and the increase in volume of traffic necessitated a rearrangement of the yard tracks, and the opportunity was taken advantage of to utilize the more modern interlocking appliances and connections. The railroad company decided to introduce 11 additional switches, each of which was to be equipped with a lock, also 29 locks on switches not previously equipped, and 12 additional signals. Had a separate lever been required, as formerly, for each switch, each lock and each signal, the number of levers would have been increased from 116 to 179; but, on the contrary, the new plant, recently put in operation, has but 87 levers, a relative reduction of about 51 per cent.

A still more striking illustration may be had by comparing our present practice, not with our previous practice, but with the English practice of to-day. The Union Switch & Signal Co. recently submitted to Saxby & Farmer a plan of the new terminus of the Central of New Jersey at Jersey City, together with a specification of the signaling required, and a request that they should state the number of levers that they considered necessary to properly operate and interlock the terminus in question. They replied that they would recommend the use of an interlocking frame of 185 levers; but the plant actually established at Jersey City [see *Railroad Gazette*, June 28, 1889] consists of but 66 levers, a relative reduction of about 64 per cent., and yet it accomplishes all that the English plant of 185 levers could accomplish.

If the English and American practice in the case of the Jersey City plant are a fair criterion, then the great London Bridge apparatus, the largest in the world, if rebuilt upon American principles to-day, would be reduced from 280 levers to 100. Over-conservative public opinion has apparently influenced the Board of Trade to place legal restrictions on manufacturers and railways, which debar them from enjoying the benefits and economies of concentration.

Mr. Soule then described electro-pneumatic interlocking apparatus, referring to the first one ever made, that at Philadelphia in 1876. The fluid now used by the Union Switch & Signal Co. in the winter is a mixture of one part chlorate of calcium to three parts of water.

Thirteen of these pneumatic interlocking machines have been put in service during the last five years, and the machine now being put in at Kansas City has 36 levers for the operation of 30 switches, with locks and detector bars, 57 signals, 87 indicators and one set of movable frog. At Pittsburgh, on the Pennsylvania, there may be seen four plants in operation, at Fourteenth street, Seventeenth street, East Liberty and Wilkinsburg. The same supply of compressed air feeds the four pneumatic interlocking plants and the twelve sets of pneumatic block signals.

Having previously described automatic clock-work block signals, Mr. Soule went on to give a brief résumé of block signaling, including the Sykes system, and followed this by an account of the automatic pneumatic block system at Pittsburgh, described in the *Railroad Gazette* of Aug. 23 and Sept. 6 last. The Union Switch & Signal Co. are now introducing this system on seven miles of the Central of New Jersey, between Jersey City and Bergen Point. The road has four tracks for a portion of this distance, and double track the rest; the seven miles will be subdivided into 19 blocks, which will therefore average three-eighths of a mile in length.

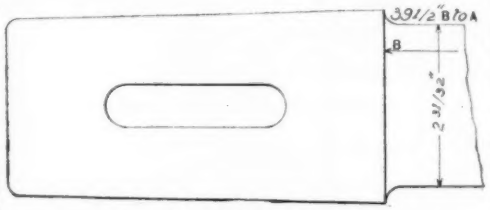
In conclusion, Mr. Soule said: From the facts presented, it appears that recent practice in signaling and interlocking has resulted in substantial economies, which have been secured principally by concentration. It would seem difficult to accomplish much more in that direction with manual apparatus, and the outlook for further gain is probably in the extended use of the pneumatic system, which is very efficient either for interlocking junctions and terminals, or for the operation of a system of block signals; the pneumatic method possessing distinct and decided advantages for lines which have a heavy traffic.

Steel Piston, Paris & Orleans Railroad.

We have frequently called attention to the desirability of using lighter reciprocating parts in locomotives, in order to diminish the difficulties of proper counterbalancing. One of the steps in that direction is the use of lighter pistons. The illustrations herewith show a design of piston used on the Paris & Orleans Railroad in France. It is not the lightest of the type, but is considerably lighter than pistons in general use in the United States. The centre is made of either forged or cast steel, and the packing rings are of cast iron. The dimensions given are from the original dimensions in millimeters reduced to the nearest $\frac{1}{32}$ in. The design is not offered as the best of the type for American service, but merely as an example of light pistons in actual and successful use.

The form resembles the type of piston used on the Pennsylvania some years ago for 20-in. cylinders, which was made of wrought iron instead of steel. That piston was abandoned as being too expensive and cast iron was again used.

It is suggested that, with the later advances made in the art of making soft steel castings that can be relied upon, there is no good reason why steel pistons should not be used. A possible objection may be that when the cylinders are rebored and the pistons returned the



Cross Head End of Piston Rod.

difference in relative diameters will be so great that the piston must be renewed, which would make it perhaps more expensive than would be desirable.

Purification of Feed Water—Northwest Railroad Club.

At the regular meeting of the Northwest Railroad Club, the evening of Dec. 7, the above subject was discussed.

Mr. J. L. Pattee, of the St. Paul, Minneapolis & Manitoba, introduced the subject with a very carefully written paper, embodying many analyses of waters. He treated the subject under the heads of purification in the tender by chemical means, purification by mechanical means and purification at the source of supply. The analyses presented showed the great variety in scale-producing salts in the waters on one road. Mr. Pattee's conclusion was that the most practicable, and indeed the only practicable, method of purification is at the source of supply, selecting the sources with all possible care and treating each water according to its particular needs. We shall give some portions of this paper in a later issue.

Brief papers were presented by Mr. W. T. Reed and Mr. Mackintosh. Mr. C. N. Hunt, Secretary and Treasurer of the Field Feed Water Purifier Co., read a paper from which extracts follow.

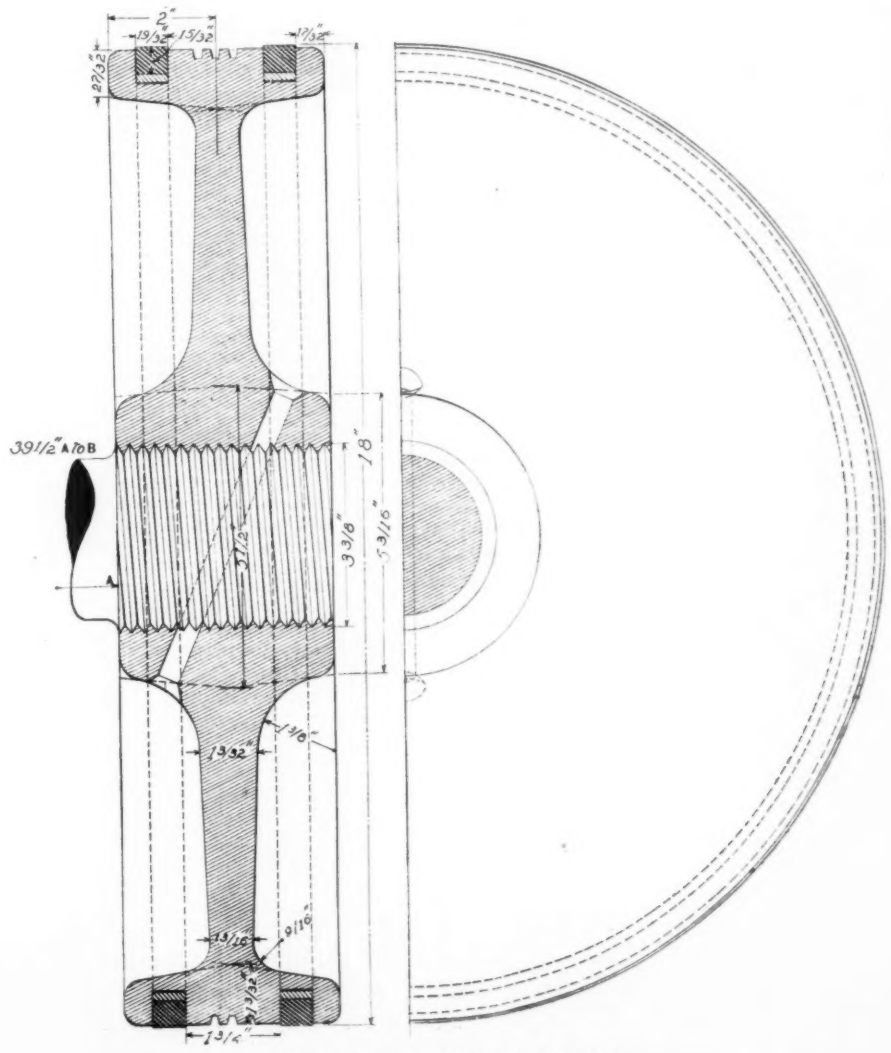
The subject is divisible into three parts.
First: Incrustation, its causes, effects and cures.
Second: The deposit of sediment, its effects and remedies.
Third: The impurities in water which produce priming, its effects and remedy.

To quote from a report of the Committee of the Master Mechanics' Association: "It is not necessary to dwell upon the formation or incrustation in boilers; its causes are already so well understood that it needs no special comment. Suffice to say that carbonates and sulphates of lime and carbonate of magnesia are the prevailing elements contained in the waters which form incrustation; chloride of sodium, fine clay, alumina and silicates are also found, but generally in diminished quantities, so that probably a large proportion of the difficulty would be overcome by expelling the lime and magnesia. This can be done by evaporation or by chemical means, but such a process would be too expensive, as has been clearly shown in former reports." Chemical writers tell us that 95 per cent. of scale-producing matter in boiler waters is made up of carbonates of lime, magnesia and iron, and the sulphate of lime, and that these substances form what is known as "temporary hardness" in water, that is, hardness caused by the bicarbonates of the alkaline earths, and which disappears in boiling. The other five per cent. of hardness in water is called "permanent hardness," caused by the chlorides, sulphates and nitrates of the alkaline earths, which is not lessened by boiling. Any plan that will easily and cheaply remove 95 per cent. of the scale forming matter should certainly receive attention. Moreover, it has been proved by recent experiments in England that, in purifying water, it is not necessary to reduce the degree of hardness lower than six or seven degrees, as the heating surfaces of a boiler are kept practically clean when water of this degree of hardness is used.

To purify feed water very many plans have been devised. The various methods thus far employed for the prevention of scale may be divided into three general classes. First, the use of chemicals, which will counteract the effect of the scale-forming impurities, or, in other words, the use of "boiler compounds;" second, methods for purifying the water at the water stations while in the reservoirs, before it enters the locomotive tender; and, third, methods for purifying water mechanically after leaving the locomotive tender and before it is allowed to circulate freely in the boiler.

In regard to the first method, the use of chemicals, I will quote the words of the committee appointed by the American Railway Master Mechanics' Association: "Your committee had all experimented with powders, fluids, batteries, etc., but the majority looked upon all such nostrums with suspicion, believing them to be more or less injurious to the boilers. In this report, as well as in former ones, the use of compounds for removing incrustation is not recommended, the committee believing the only effectual remedy being to purify the water before it is allowed to enter the boiler."

The chief objection to the second method, purifying



STEEL PISTON—ORLEANS RAILROAD.

the feed water in reservoirs at the stations, seems to be the great outlay of cost necessary to do this. One or two roads in the United States have adopted this system, but the first outlay bars most of the railroads from using this method.

In connection with this system, storing rain and surface water has been several times recommended by the above-mentioned committee as perhaps the only method of getting pure feed water for boilers. While much good might be accomplished by a judicious and careful placing of water tanks along the lines, where the rainfall is sufficient and the lay of the land would permit, so as to get the water from rivers and creeks and surface reservoirs, and, if needful, pipe it to the point desired to locate the tanks, instead of digging deep wells, and thus getting the very hardest of water, still the lack of sufficient rainfall in certain portions of the West and Northwest, and the first cost or outlay has prevented much being accomplished in this direction; and besides, surface water is objectionable, it being more or less impregnated with lime and other salts of the earth, and during seasons of rain and high water it is thick with mud, causing boilers to foam and produce incrustation. And so we come to the third method, which, as far as my research has led me, is the most practical and economical plan for purifying feed water, provided it is possible to accomplish the same in that way, namely: To purify the feed water by some mechanical device, through the action of heat, after it leaves the tender and before it enters into the general circulation of the boiler.

Successful inventors, like successful railroad men, are commonly distinguished for simplicity and directness of aim, using the very difficulties in the case as stepping-stones to the object in view. This is notably true of the Field feed-water purifier. The apparatus is a simple one, and uses the very same natural law which causes the incrustation, namely: The affinity of the active salts for iron when freed from the water by boiling.

This invention purifies the water mechanically after it leaves the tender and before it enters the boiler. The principle upon which it works is that of heating the feed water to and beyond the boiling point, thereby causing all scale-forming impurities to be precipitated. This is accomplished by causing the feed water to pass through a continuous series of pipes some 75 or 85 ft. in length located wholly within the boiler, whereby the chemical impurities are precipitated in the purifier pipes, the interior construction of which is such as to prevent the sediment and scale-forming substances from being carried into the boiler. The feed water from the injectors or pumps passes nearly to the forward end of the boiler, where it goes through the usual check valves and thence into the purifier, the purifier being connected directly to the feed-water pipes on each side of the boiler. After the water flows through the lengths of pipe forming the purifier, that is, six times lengthwise of the boiler, it passes out of the upright pipes into the boiler. These upright pipes extend into the dry steam space 6 or 8 in. above the highest water line. The purifier is placed in the boiler, out of sight, and does not disfigure the boiler. The horizontal pipes are completely submerged in water, and placed directly over, but not touching, the fire flues.

The outer tube or conduit is four inches in diameter and made of sheet steel rolled in circular form and riveted. Inside of the main tubes are two other tubes somewhat shorter and smaller than the outer one; one is about three inches and the other two inches in diameter. These are also made of sheet steel rolled into circular shape, but are not closed, there being a half-inch slot or opening all along the bottom of each inside tube. These tubes are also perforated to allow the water to circulate freely between and through the tubes. The inner tubes are held concentric with the outer one by a small malleable iron casting at each end, which is in the form of a cross, and fitted with grooves in one face for the reception of the ends of the tubes. A longitudinal bolt holds them together.

The difficulty, however, has not been to precipitate the scale and sediment, but to get rid of it after it has been precipitated. A purifier of this nature must have a means of blowing off the impurities it is designed to collect; otherwise it would be valueless. The blowing off and cleansing out of the purifier is accomplished in the following manner: On the right-hand side of the boiler a tee is interposed between the check valve and the transverse pipe inside of the boiler which forms a portion of the purifier. At the bottom of this tee is a blow-off cock or valve worked by a connection in the cab. When the purifier is to be blown off, this valve is opened, and the water and steam, in flowing out, carry the impurities with them. It will be remembered that the ends of the short induction pipes project vertically into the steam space. The only water, therefore, which will escape from the boiler during the operation of blowing off will be that standing in the purifier at the time. Steam will then follow. The passages are so constructed that everything will pass to the right side, and thus prevent dirt from getting into the left check valve. The check valve on the right side is protected by the shape of the interior of the tee, there being a curved diaphragm interposed within the tee to deflect all dirt from the check valves. From the blow-off valve the outflow can be piped down outside the engine to any desired point, care being taken that the pipes have no sharp bends and no pockets to hold sediment. The blow-off should be operated every two to four hours, depending upon the water.

By using dry steam only for blow-off purposes, the blow off can be operated as easily while the locomotive is in motion as at a standstill. An automatic blow off can be used if desired.

The purifier being of such great length, the feed water reaches the boiling point by the time it has passed three times the length of the boiler, and from that point until it reaches the outlet pipes, a distance of 40 ft., the water is increasing in temperature and the calcium bicarbonate and the calcium sulphate, oxides of magnesia, iron and other salts are freed from the water and in traveling the last half of the purifier are precipitated and adhere in moist condition to these inside metal surfaces, from which they are removed by the dry-steam blow-off before they have time to harden.

The purifier holds about 40 gallons of water and has 250 sq. ft. of metal surface, to which the salts are exposed when freed from the water by the action of the heat. A test of this device on one of the main lines of railroad in the United States for a period of six months shows a clean boiler; no mud, no scale formation on crown sheets or flues, or in purifier pipes. The water has been let out of the boiler once in six weeks to two months, and but little loose sediment was found.

We should be pleased to remove any doubts by placing a purifier, at our own expense, on any road for a test of its merits.

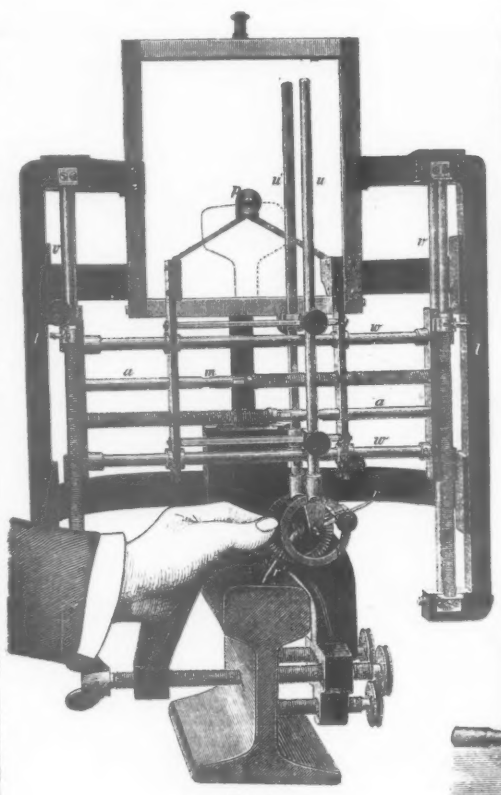


Fig. 1.

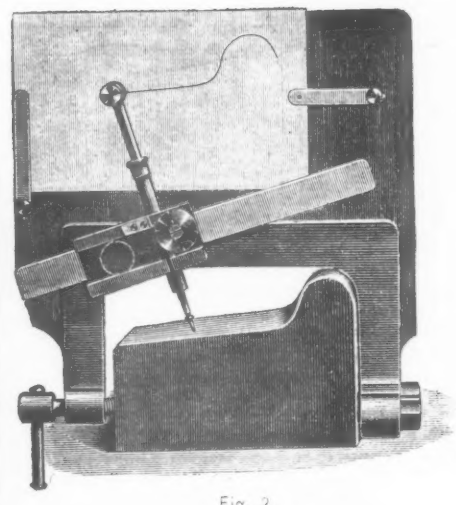


Fig. 2.

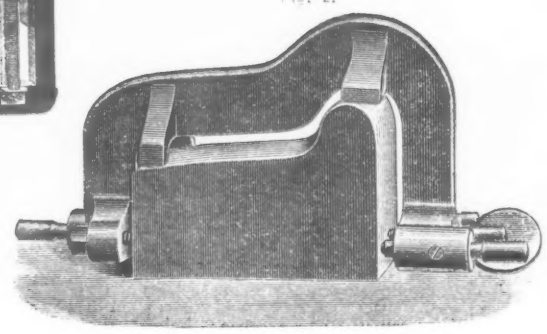


Fig. 3.

PROFILE MEASURING APPARATUS.

Devices for Measuring Rail and Tire Profiles.

Fig. 1 of the accompanying engravings represents what is known as Schilling's profile measuring apparatus, recently patented in Germany. For the illustration and particulars we are indebted to the *Centralblatt der Bauverwaltung*.

In using it, a frame, *l*, is attached vertically to the rail by means of the saddle and clamping screws, as shown. Within this frame are arranged two other sliding frames, one of them, known as the inner frame, being capable of moving laterally on the two guide rods *w w*. These, in turn, can slide up and down on the rods *v v*, which latter constitute the outer frame. To counteract the slight friction of the slides, springs, shown in the engravings, are employed. The inner sliding frame carries on opposite sides two vertical rods, *u* and *u'*, the height and position of which can be readily adjusted and maintained by clamp screws. Both rods are independent as regards adjustment, and carry at their lower ends tracing points, *r* and *r'*, which can be set at any desired angle. The inner frame may be fixed in any position by tightening clamp screws on the horizontal and vertical guide rods.

In measuring a rail section, the tracing point *r*, being adjusted at the desired angle and its carrying rod *u* fastened to the inner frame, is passed around the rail until it reaches a point beyond which it would leave the rail surface. At this point the rod *u'* and tracing point *r'* are substituted for it, the point *r'*, in commencing the second part of the tracing, being placed at the side of the point *r*. The latter is then thrown out of use. In following the outline of a rail head and part of the web two substitutions of the rods *u* and *u'* are generally necessary, using first the rod *u* and point *r*, then *u'*, and finally *u* again. With smooth rail surfaces the vertical and horizontal helical springs already mentioned are almost sufficient to produce automatic action of the tracing points. The paths of these are reproduced on a suitably mounted vertical diagram sheet by a pencil point *p*, held in the upper part of the inner frame. The whole operation of putting the device in position on the rail and getting a rail outline takes about seven or eight minutes. The diagram obtained is of full size. It is to be observed that the rail need not be taken up for this purpose, but remains in its proper position in the track. Having obtained the diagram, the amount of wear of the rail is readily seen by comparison with a new rail section, the latter being drawn on tracing paper or cloth and laid over the diagram of the worn rail. The apparatus is turned out by the German firm of B. Pensky, Nachf., at Berlin, its price being given as 150 marks, or about $36.

In figs. 2 and 3 we show another measuring device, specially designed for determining the wear of tires, though it may be applied to rails also. The engravings are reproduced from *Glaser's Annalen für Gewerbe und Bauwesen*. The apparatus was devised by Mr. J. Patrik, of Frankfort-on-the-Main, Germany, and is put on the market by Messrs. Wirth & Co., of the same place. Referring to fig. 2, it will be seen that it consists of a frame cast in one piece with a plate on which a diagram sheet is mounted. The frame is clamped to the wheel as shown, the diagram plate being in a radial plane. Guide rods are arranged on both sides of the plate for a sliding block in which is fitted a movable rod. The upper end of this carries a pencil point for marking on a diagram sheet, while the lower terminates in a small roller, not well shown in the cut, intended to follow the outline of the tire. The rod moves in a sleeve and a spring presses it down gently so as to keep the lower end with the roller in contact with the tire. It will be noted that the general principle is the same as in the apparatus already described. The tracing roller, with its rod, may be lifted out of contact with the tire surface by means of a light cord passing over rollers, as shown. As both sides of the diagram plate are available, both right and left wheel profiles can readily be taken, the guide rods having opposite inclinations.

In taking several measurements of the tire at different times it must be borne in mind that the apparatus should be clamped in the same place each time. To insure accuracy in this respect Mr. Patrik proposes the use of the device shown in fig. 3. It consists simply of a yoke having projecting lugs, which rest on the tread and flange in the manner shown, insuring subsequently the radial position of the diagram plate. The yoke is fitted further with two sliding prick punches, and, after being securely clamped on the wheel, these are driven in by blows with a hammer, giving permanent reference marks.

Both Mr. Schilling's and Mr. Patrik's devices are simple and apparently effective, and would seem to recommend themselves for general use.

Report on the Armagh Catastrophe.

The British Board of Trade report on the collision near Armagh, Ireland, June 12, has just been published. It is made by Major General C. S. Hutchinson, the oldest inspecting officer of the department, and is dated July 8, the publication having been deferred on account of a criminal prosecution for manslaughter pending against James Elliott, the Traffic Superintendent, who was in charge of the train. Mr. Elliott was acquitted before the publication of this report.

The report is very long, and in view of the results of the collision, 78 deaths (to July 8) and 260 injuries, is perhaps reasonably so; but it gives no facts to alter the opinion we expressed in discussing the accident briefly at the time of its occurrence, which was to the effect that such an accident to a passenger train in the United States would be in the last degree improbable, by reason of the fact that it could have been so readily and surely prevented if the cars had been equipped with ordinary hand brakes. Among the numerous points on

which Gen. Hutchinson passes censure is the placing of the two brake vans at opposite ends of the train. He says that they should both have been placed at the rear, which is true enough; but the necessity of having available hand brakes in every vehicle seems to be entirely unappreciated. The influence of 60 years' experience without them is so strong that the simple lesson deducible from American practice is apparently lost. And yet the second important lesson receives full recognition, and Gen. Hutchinson says, in the most impressive manner, that this "very terrible" accident would in all probability have been prevented had the excursion train been fitted with an automatic instead of a non-automatic continuous brake. It appears, from editorial comments in the English papers, that the law concerning the use of automatic continuous brakes on passenger trains has been amended by an act of Parliament since this collision, so that now the Board of Trade has power to compel their adoption. The *Engineer*, in its editorial comments on the report, enters into calculations about the brake power, the weight of the train and the effect of the grade, and concludes that with the one brake van there was a slight margin of power by which the ten cars ought to have been held, and General Hutchinson's experiments with similar trains on the same grade afterward go to prove that the *Engineer's* calculations are correct; but the margin is so small—about 7 per cent.—that no great weight is to be attached to the conclusions reached. It is also surmised that the passengers who were in the brake van had carelessly or mischievously partially applied the brake while ascending the grade, thus causing the stoppage; but this makes it necessary to assume that when on the running back of the train the brake was apparently put on, it was, in fact, turned the wrong way and let off. This, however, is mere speculation, as the witnesses are all dead.

The particulars of the disaster, as given in the report, are not without interest, and we will briefly recapitulate them. The empty train started from Armagh at 10:15 a. m. The regular train started at 10:35. The foremost train got to within 634 ft. of the top of a 70-ft. grade when it was stalled. The train was cut in two behind the fifth vehicle and ten vehicles ran back 1½ miles, where the collision occurred on an embankment 46 ft. high. The regular train had seen the runaway and was nearly stopped. Five vehicles broke away from the rear of the regular train, but were stopped by a hand brake after they had run back 1,300 ft. The line is worked under the train staff and ticket system, the road having been built in 1864, before the use of the block system was compulsory. A curious chain of errors led up to the catastrophe. The first link in this chain was that the acting Locomotive Superintendent furnished a passenger engine with 6-ft. drivers, expecting to haul only 13 carriages. If he had known there were to be 15 he would probably have sent a freight engine. General Hutchinson has carefully calculated the power of the engine, which had 16 × 22 in. cylinders and weighed 33½ tons, and finds it to be just sufficient to haul the train over the road it had to travel, the point of collision having been on the ruling grade. The cause of the failure to haul the train up the grade, he says, "was some mismanagement of the engine." The runner had no experience on this part of the road, except as fireman, and the Locomotive Superintendent is censured for appointing a man of so little experience for this train, as well as for sending an engine with so small reserve power. The next link was a remark by the station master, who, when the runner remonstrated at the two extra cars, told him that other runners never grumbled. This led the engineer to go without a helping engine, when otherwise he would have had one. The third link was the cutting of the train in two when there was a regular train immediately behind it which could have pushed it over the hill with less loss of time than would have been necessary to take the train to the next station in two parts. Next came a difficulty in starting the five cars after they had been separated. The engine stopped in such a position that it had to be reversed and moved back a little distance before it could start the train; in doing this, the hind portion of the train was slightly bumped, and the stones, some eight or ten of them, which had been put under the wheels, were crushed. Then it was attempted to couple the whole train together again, so that the engine could hold the rear cars; but in running to hook the coupling a man fell over some old rails lying by the side of the road, and so failed to make the coupling. The *Engineer* says that these old rails should have been used as sprags, but there was only one car in the train which had spoke wheels. The theoretical power of the engine at 15 miles an hour was 186 tons, and the experimental train fitted out afterward by the inspector weighed 185½ tons. This the engine took up without difficulty, so that, as the *Engineer* says: "1. If a freight engine had been used there would have been no accident. 2. If the station master had not taunted the runner there would have been no accident. 3. If the engine had not stopped "blind" there would have been no accident. 4. If the guard had not fallen over the old rails there would have been no acccident."

General Hutchinson says it was a grave error to allow passengers to ride in the brake van, and that the practice should be sternly prohibited. Mr. Elliott is responsible for this, and for starting the train with locked doors, though the station master at Armagh is responsible for allowing the doors to be locked. If the block system had been in operation the severity of the accident would have been mitigated, because the regular train would have been standing at Armagh station and the moving train would have had 160 ft. of level track in which to slacken its speed. Moreover, the signalman would have had a chance to throw the runaway upon a siding and given it still more chance to slacken. Finally, it seems desirable that wooden sprags should form part of the equipment of passenger as well as of freight trains.

The last English papers report the death of one of the passengers injured in the collision, and state that this makes the total number of deaths 83. It is believed that the disaster will cost the Great Northern over a hundred thousand pounds.

THE SCRAP HEAP.

Notes.

The death penalty was executed upon a train robber at Guaymas, Mexico, Monday morning last.

The Gulf, Colorado & Santa Fe has issued a circular requesting employés not to make presents to their superiors.

Conductor Austell, of the Nashville, Chattanooga & St. Louis, took up a ticket the other day which was issued Aug. 15, 1855.

A fire in the yards of the Pullman Car Works, Pullman, Ill., Dec. 4, burned up $100,000 worth of hardwood lumber in the drying kilns.

One passenger and seven loaded freight cars, together with a shed, were burned at the Queen & Crescent station in Vicksburg, Miss., last week.

The city of Port Arthur, Ont., has seized one locomotive and 17 cars of the Canadian Pacific for $15,000 taxes which it is claimed is due the municipality.

The Strong locomotive has been running for a few days past on the Cleveland Cincinnati, Chicago & St. Louis and on the Cincinnati, Hamilton & Dayton.

A conductor and five brakemen of the New York, Pennsylvania & Ohio have been arrested at Urbana, O., for robbing freight cars. One of the men made a confession, and it is stated that large quantities of goods have been found.

At Wilkesbarre, Pa., one morning last week, a crowd of men about to board a workingmen's train on the Central of New Jersey, bound for the Ashley car shops, were run into by a freight on an adjoining main track and four of the men were killed. It is said that they received warning, but were hurrying so heedlessly to get aboard the train that they did not notice it. A dozen others were slightly injured.

Negotiations are in progress looking to the dismissal of the suits entered by the Attorney-General of Iowa against a number of roads for $250,000 in penalties for disobeying the law concerning rates, and also for dismissal of the injunction proceedings begun by certain railroads against the State Railroad Commissioners. Both suits have been in statu quo for several months, in accordance with the decision of the United States Court that actual experience with the reduced rates must be had before an intelligent final decision could be made.

The tracks of the Central of New Jersey line from Newark to Elizabeth, have been arranged, at the point where the Pennsylvania and the Lehigh Valley desire to put in a crossing for their new lines, in such a manner as to neatly check any attempt to put in the crossing surreptitiously. The Central has two tracks at this point, and it has put in gravel so as to raise one of them about a foot higher than the other, so that a grade crossing can be made only at considerable pains and expense; and it would be of doubtful safety after it was in.

The people of Laredo, Tex., were surprised the other day at the expeditious manner in which a train load of narrow-gauge cars was unloaded from standard-gauge platform cars on which the smaller cars had been transported from St. Charles, Mo. The rails upon the floor of the cars were connected so as to make a continuous track the whole length of the train and the small cars were thus all drawn off by means of a single inclined plane at the end, after the manner employed in unloading circus wagons. The more remarkable feat of carrying loaded standard-gauge cars upon the top of narrow-gauge cars, as practiced in Pennsylvania, would probably "astonish the natives" of Laredo.

General Manager Kruttschnitt, of the Atlantic System of the Southern Pacific, has issued a circular, of which the following is given as the substance: Recently the company has had to pay heavy damages in one suit, and now has another pending in which a large amount is involved. Both of these are for personal injuries, and in both the party injured was on the train by permission and was not an employé. To defend itself the company will from now on absolutely prohibit any one from using or living on work, construction or freight trains who is not an actual employé. Under these orders the families of foremen will not be permitted to occupy camp cars, and boarding bosses and mistresses, as well as cooks, waiters, etc., must all be entered upon the company's rolls as employés, at fixed salaries, which will be paid to them in person only at the pay car.

The Pennsylvania Railroad Relief Department.

The annual election for members of the Advisory Committee of the Pennsylvania Railroad Relief Department has just been held. The members of this relief fund who are entitled to vote number now about 21,000. A form of ballot specially prepared, and containing instructions as to how to use and forward, is addressed to each member, and sent out through the officers of the different lines comprising the system popularly known as the Pennsylvania Railroad. The ballots are so arranged that after being filled up they can be folded and sealed, exhibiting on the outside the printed address of the appointed tellers, in care of the superintendent of the department. They are then forwarded by train service or U. S. Mail. A day is fixed for the election, in this case Nov. 25, and ballots are forwarded on that date or during the week preceding. A week later the tellers, of whom there are three, appointed by the Advisory Committee, meet and count the ballots. The number of members voting on this occasion was about 15,000, or some 70 per cent. of those entitled to vote. The counting of the vote, with the necessary verification of the status of the voters, occupied about three days, the tellers being aided by a large force of clerks detailed for the purpose.

There are six members thus chosen to represent the contributors to this fund, and much interest is taken in the election, as is shown by the fact that votes were cast for 116 candidates.

The statement of the voluntary relief department of the Pennsylvania lines, west of Pittsburgh, shows a total membership of 7,232. The average percentage of members to total number of employés is 28.66. On one of the roads in the system it is over 50 per cent.

Telegraphic Cipher for Railroad Men.

Mr. John C. Hartfield, 92 Pine street, New York City, will shortly publish a railroad telegraphic cipher code, especially adapted for the use of general managers, traffic managers, general freight agents, and officers in charge of operating and car service departments. Mr. Hartfield has had a large personal experience in the freight department and is the compiler of the private codes of the New York Central fast freight lines and the Merchants' Despatch Transportation Company. The work, will contain about 20,000 cipher words and the phrases will be placed in strict alphabetical order. The cipher words will also be arranged in alphabetical order, making translation easy.

Peruvian Railroads—The Grace Contract.

Herapath's furnishes the following particulars of the contract between the Peruvian government and the representatives of the bondholders, commonly known as the "Grace Contract;" also of important concessions which have been secured side by side with that instrument. It may be broadly said that, in consideration of Peru being released from all responsibility for the loans of 1869, 1870 and 1872, she hands over all the railroads of the country, with their rights and responsibilities, and consents to pay £80,000 a year for 33 years, the first payment to be four years hence. The bondholders are bound to make certain extensions, and to raise a loan of £6,000,000 for the purpose. The concessions are:

The right to connect by railroads to be held in perpetuity: 1. The Southern system of Peru with the frontiers of Bolivia; and 2. The Central system of Peru, when completed, with the navigable waters of the Amazon, with the addition of a land grant of 6,000 hectares (about 15,000 acres) of land for every kilometre of railroad built. A further concession of 2,000,000 hectares (or about 5,000,000 acres) of land. The transfer of the Cerro de Pasco silver mines, for the benefit of the bondholders, subject to certain existing charges, has been definitely arranged. Negotiations have been commenced for a concession from the Bolivian government, for a railroad to be constructed in connection with the Southern system of Peru, together with a land grant and subsidy from the Bolivian government. A complete scheme has been elaborated for carrying into effect the concessions of the contract, which are expected to result to the bondholders in an immediate income of upwards of £200,000 a year.

The contract itself contains 35 clauses. The first provides for the wiping out of the three loans referred to. The second cedes to the holders of the bonds all the railroads of the state for 66 years, excepting the line from Paita to Piura and from Pisco to Ica, which are subject to existing contracts.

The bondholders may work for their own account the existing telegraph lines and telephones.

The bondholders undertake:

(*a*) To construct and finish within three years the section from Chicla to La Oroya, on the railroad from Callao to La Oroya.

(*b*) To construct and finish within two years the section from Santa Rosa to Marangani, and within the next two years the section from Marangani to Sicuani on the line from Juliaca to Cuzco.

(*c*) To construct and finish within six years 160 kilometres of railroad in various directions.

(*d*) To repair and put in proper condition for traffic within two years all the railroads they may receive.

The government of Peru cedes to the bondholders the right of free navigation on Lake Titicaca on certain conditions, and cedes to the bondholders all the guano existing in the territory of Peru, up to the amount of 3,000,000 English tons, and also certain deposits on islands. There are certain conditions, however, one of which is that should the guano ceded not reach the amount of 3,000,000 English tons, Peru shall not be responsible for the difference. The government shall pay to the committee 33 annuities of £80,000 sterling secured on the customs. The bondholders may mortgage the railroads and guano ceded to them as a guarantee for one or more loans for producing funds to be used in the work, which shall not exceed the sum of £6,000,000 sterling.

The bondholders bind themselves to deliver to the government of Peru £50,000 on the coming into operation of this contract, and £190,000 in 19 monthly instalments of £10,000, commencing 90 days later. . . .

Railroad Grade Crossings in Illinois.

In the petition of the Chicago & Calumet Terminal against the Chicago, Burlington & Quincy, in regard to the mode of crossing at La Grange, Cook County, the Illinois Railroad Commission has rendered a decision, ordering that the petitioners have leave to cross with their track the tracks of the respondent at the point designated in the petition, on grade and level with the tracks of the respondent, but only on condition that the petitioner shall, at its own expense, set up the latest, best and safest interlocking appliances, signals and devices. The petitioners are required, before proceeding to construct such crossing, to give bond in the sum of $20,000, conditioned that they will perpetually maintain such interlocking system in good order and condition and pay all salaries of men needed to efficiently maintain and operate the same. The commissioners desire it distinctly understood that this decision does not commit them to a general policy favoring grade crossings, but wherever circumstances favor or even permit, the commissioners would much prefer the separation of tracks of crossing roads. Ten days is allowed for either party to file a petition for a rehearing, and the operation of the decision is suspended for that time.

South Carolina Railroads.

The annual report of the South Carolina Railroad Commission shows that in June, 1888, there were 1913.4 miles of road in the state, and in June, 1889, there were 2093.4 miles, an increase of 180 miles. The physical condition of the roads was much improved. Two hundred and ninety-seven miles were laid with steel rails, the ballasting made better, and better cross ties used. The bridges and trestles were improved, and the equipment of the roads made much more complete.

During the year there were 51 persons killed and 183 injured. Of the 51, eight were killed from causes beyond their control, and 43 by their own carelessness. No passenger was killed from any fault on the part of the railroad. There was a decrease in net earnings of $413,670. The total income was $407,657 more than in the preceding year, but the increase of expenses was $821,327.

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EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

In this issue is given the side elevation and half plan of the class I locomotive of the Chicago, Burlington & Quincy. This locomotive has been in service between Chicago and Aurora during the past three months with a success most gratifying to its constructors. The design is new, and many of the details and arrangements of parts are novel. The fundamental plan of the engine is the same as that of the class H engine on the same road. It will be noticed that the same truck is used in both classes. In the class I, however, the truck is placed under the tank instead of under the front of the boiler, as in the class H, and it is not equalized with the drivers. This is probably the heaviest suburban engine now in use. A few, however, on the Boston & Providence division of the Old Colony nearly approach it in weight. The success of the two-wheel truck on the fast express and freight locomotives of the Burlington has led to its adoption on a suburban engine with the result of making a locomotive having fewer wheels and a larger proportion of the total weight available for adhesion than is usual with engines in suburban service, or even in through express service. We commend this locomotive to our readers as deserving of more than ordinary attention, both in the matter of its general design and in its probable durability in service.

The number of designs of the M. C. B. standard automatic vertical plane car coupler is still increasing with the rapidity so well known as a feature of car coupler invention. Some of the newer ones are ludicrous in the extreme. One has a knuckle that "gets upon its ear" and crawls back into the head in a manner not unlike that of a snail, in order to get into a safe place. No provision is made for bringing it out again, and as it has not the volition of the animal which it resembles, this important part of its functions is to be provided for in some unknown way. Seriously, there is a danger of a complexity of design in the car coupler field not before known, and the difficulty of choosing the best from among them all is too great already for any one who has not made the subject a special study. There is, however, one test which greatly simplifies the selection of designs from among the multitude, and that is in the direction of material and workmanship. Probably no other railroad device is to a greater extent dependent upon the excellence of its material for its success. The good vertical plane couplers that are now in use owe their superiority not so much to their shapes and principles of operation as because the malleable iron, cast steel and drop forging concerns which make them are doing good, honest work. So far, the majority of failures of couplers have been caused by the use of poor material. Only one case is prominent where the design was at fault, and that was on the Atchison, where the old "Consolidated" coupler was used. But t is not to be supposed from this that all or any designs would be perfect simply by being made of excellent material, because that is far from the truth; rather one should draw the conclusion that most failures are because of poor material which is not of sufficient strength to perform its function until the essentials of the design can be well and thoroughly tested. No one who has kept pace with the march of improvement in vertical plane car couplers, and has acquired the knowledge to be gleaned from their use during the past two years, can avoid the conviction that a majority of the inventors who are now at work on new couplers, and many of the mechanics who are modifying designs that have been in use, are either ignorant of the experience of others and of the exacting nature of the service required of a vertical plane coupler, or else are deficient in mechanical knowledge. Some of the designs now offered for sale to unsuspecting companies, and to further which good money is being wasted, are so radically wrong in theory that there is no possibility of their meeting even a transient success. There is nothing complex in the nature of the mechanics of a car coupler; that is, in the sense in which the term complex would be used in speaking, for instance, of a printing press: neither are its essential elements so abstruse as to require the efforts of the profound mathematician; but what the subject does require is a large amount of practical knowledge, both of the service in which the couplers are to be used and of the material used in their construction.

The article on another page, concerning the painful frequency of fatal accidents to trespassers on railroad tracks, is from the pen of a managing officer of one of the trunk lines. Every superintendent with a heart must agree with the views expressed. We use this expression advisedly, because it would be no matter for surprise if one were to find now and then a superintendent whose feelings of humanity were greatly deadened, if not crushed out, by the familiarity with the harrowing details of these occurrences which is constantly forced upon him. The immediate problem is precisely as stated by the writer; local police magistrates do not enforce the law. This subject, although not receiving the consideration it deserves, has not by any means gone unnoticed, and the Massachusetts Railroad Commissioners, in particular, gave it careful attention in their last report. Both their utterances and other matter bearing on the subject have received notice in the *Railroad Gazette*, as, for instance, in the articles of March 1, July 12 and Oct. 25 last. But in that very state, where intelligent commissioners have done some of the best work in enlightening public sentiment, we see a most discouraging state of things, which at once forces upon us the dark side of the question, viz., the complete neglect of the subject after spending months in discussing it in all its bearings. The Legislature, after considering the elaborate plans presented by the regular board and by the special commission on highway crossings, simply referred the whole question to the next legislature. The problem was so vast that they folded their hands and did nothing. The prohibition of new grade crossings, which has perhaps been more intelligently considered in that state than any other, has also been shown to be a most knotty question by the action of the Railroad Commissioners there in granting leave to a short new road to create nine new crossings. There is no doubt that broad considerations would dictate that new roads be made to wait until they can afford to build more bridges over and under highways, but no board of commissioners has the courage to enforce so high a standard, knowing that public sentiment would not sustain it. In the matter of trespassers there seems no remedy better than the one proposed by our correspondent today, viz., the enforcement of the law by state officers. This is substantially the same as proposed by the Massachusetts commissioners in their report. Massachusetts railroads have had some arrests made, and in the cases of confirmed vagabonds and lawbreakers some convictions were secured, but the benevolence and good nature of the magistrates weakens the law most in the case of track-walkers who are reputable citizens. These they let off. The following remarks by Superintendent Ralph Peters, of the Pittsburgh, Cincinnati & St. Louis, in the Cincinnati *Times-Star*, in answer to a sweeping criticism of his road, gives evidence in the same line. Says Mr. Peters:

> It is not "the deadly crossing." These accidents are in almost every instance the direct result of the appropriation of the private property of the railroad company by the public for use as a thoroughfare. We do all in our power to keep people off the tracks, and it keeps our watchmen busy, yet they will get on in spite of us. There are laws, but it seems they cannot be enforced. Boys and men are frequently arrested for boarding trains while in motion, but they always escape with a reprimand from the court, which does no good. Only yesterday was our watchman kept busy chasing a crowd of boys out of our yards at Pendleton, and after running them away once they ran around the house and jumped upon a train on the other side. As a result one boy fell under the wheels, had his leg cut off and died soon after. Most of the people killed by our trains were struck, not at crossings, but while trespassing on our private property. People are caught while making short cuts up the track, instead of taking the public street. Only one has been killed at a crossing, and that was where the city prohibits whistling. Of the nine citizens killed by us three were walking along the tracks, not near the street or crossing; five in attempting to climb on moving trains, and only one at a crossing.

The points of Mr. Peters' defense should be reiterated until the law-making power and the local press become familiar with them. Either good fences or more rigid restrictions of speed should be the result, and these would touch the financial nerve of the railroads; but the shock would be finally transferred, and rightly, to the public. Railroad men would put up with the proper restrictions much more cheerfully than would the public.

A correspondent in another column offers a criticism on the subject of standard train rule 103, as it appears in the code of the Pennsylvania Company. This rule, as those interested will remember, has been criticised heretofore, the making of regulations which shall apply to a break-in-two under all circumstances being a difficult matter; but our present correspondent does not criticise the rule as formulated by the Time Convention, but refers particularly to a supplementary rule embraced in the second department of the Pennsylvania's code—that in which each class of trainmen is given specific instructions for one line of work. The most obvious criticism of the paragraph quoted from rules 221 (for passenger brakemen) and 225 (for freight brakemen) is that it should have been inserted as a supplementary paragraph to rule 103 instead of being placed where it is. It is well enough to make danger signals as directed, but if the returning portion of the train is moving only as fast as a man can walk and is preceded by a pilot on foot, the paragraph would certainly seem to be of secondary importance. The Pennsylvania officers, like many others in similar cases, doubtless tried to make the matter doubly sure. Nothing is plainer, however, than that it is possible to go too far in this direction. The great safety of policies in a certain old and conservative mutual fire insurance company in Massachusetts was said to be owing to the fact that nothing more hazardous than a stone wall was ever insured by the company, and to the presence in all of its policies of a clause providing that the stone wall must constantly be kept under water; but some very successful insurance men in these latter days, and men who are by no means reckless, have concluded that it is safe to at least abolish the provisional clause, and they have made money by acting on it. Wooden buildings, perhaps, ought to be soaked; but the line can be drawn at stone walls. But if any one insists upon retaining the objectionable clause in the Pennsylvania code, the simplest way to avoid complication is to plainly state that the brakeman must get a man to make danger signals, if he can do it without delaying himself in his first object of flagging the following train. If brakemen can be got to read and remember the rule in any shape, they can be made to remember that making the signals to the front is secondary to the making of signals at the rear.

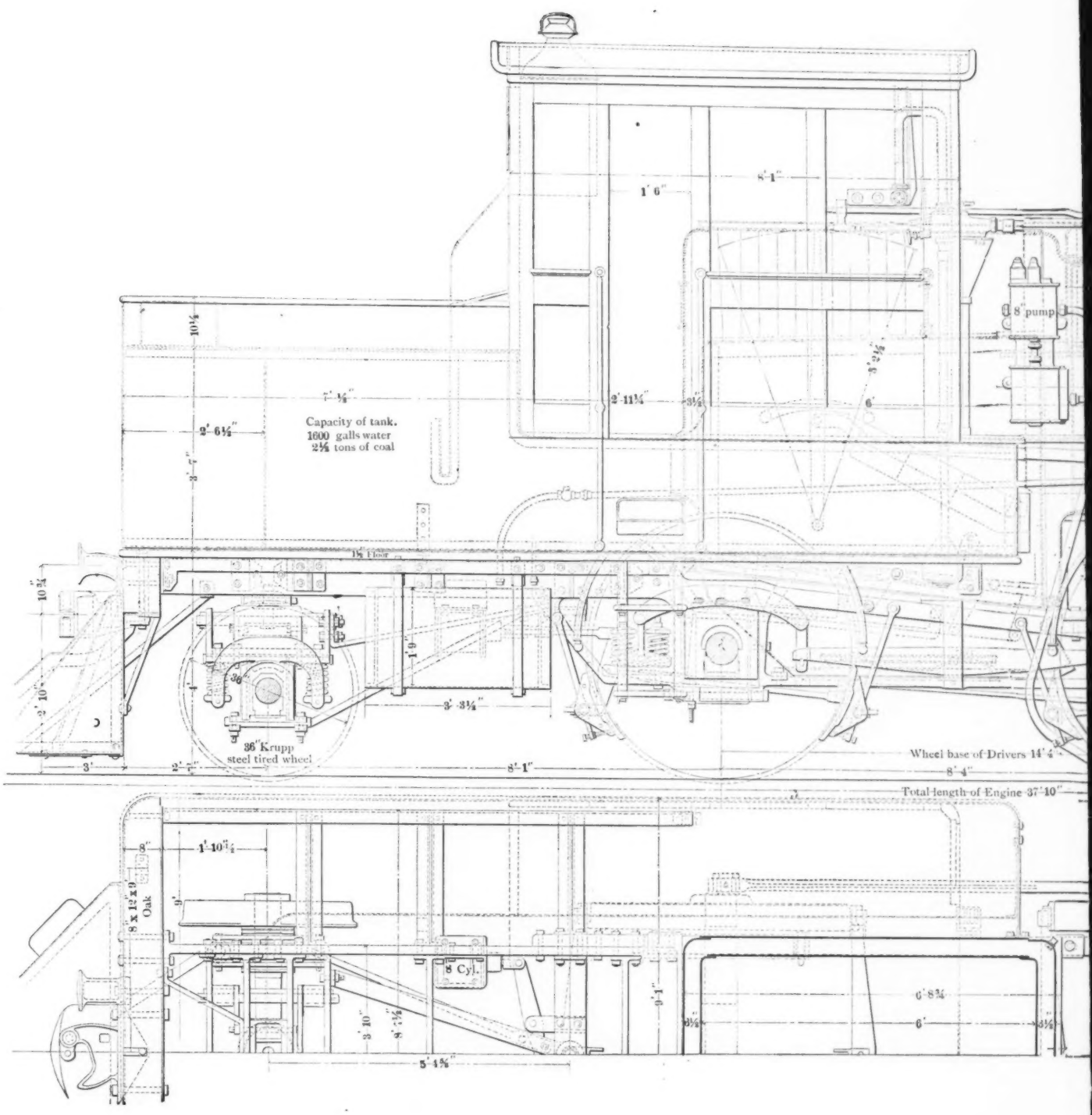
Suburban Locomotives.

Probably no class of locomotives gives more trouble to the designer than those which are required to meet the peculiar demands of suburban service. It is essential that they be constructed to run as well backward as forward, and that they be especially powerful in starting and in *accelerating* trains, in order to save time in getting away from stations. It is necessary that all the levers and mountings in the cab be arranged in such a manner as to be within easy reach of the engineer when he is facing in either direction. Also his view of the track should be quite as unobstructed at one end as at the other, and for this reason the location and shape of the tank, as well as the vertical height of the engineer's foot-plate from the rails, have to be changed somewhat from ordinary practice. As it is not advisable to run a tender ahead of a locomotive, it is almost necessary that the tank and coal bunkers of such engines be attached rigidly to the engine frame. To obtain a sufficiently large tank and coal space under these restrictions is no small problem, and sometimes ungainly designs result from a necessity for combining the tender and locomotive in one structure.

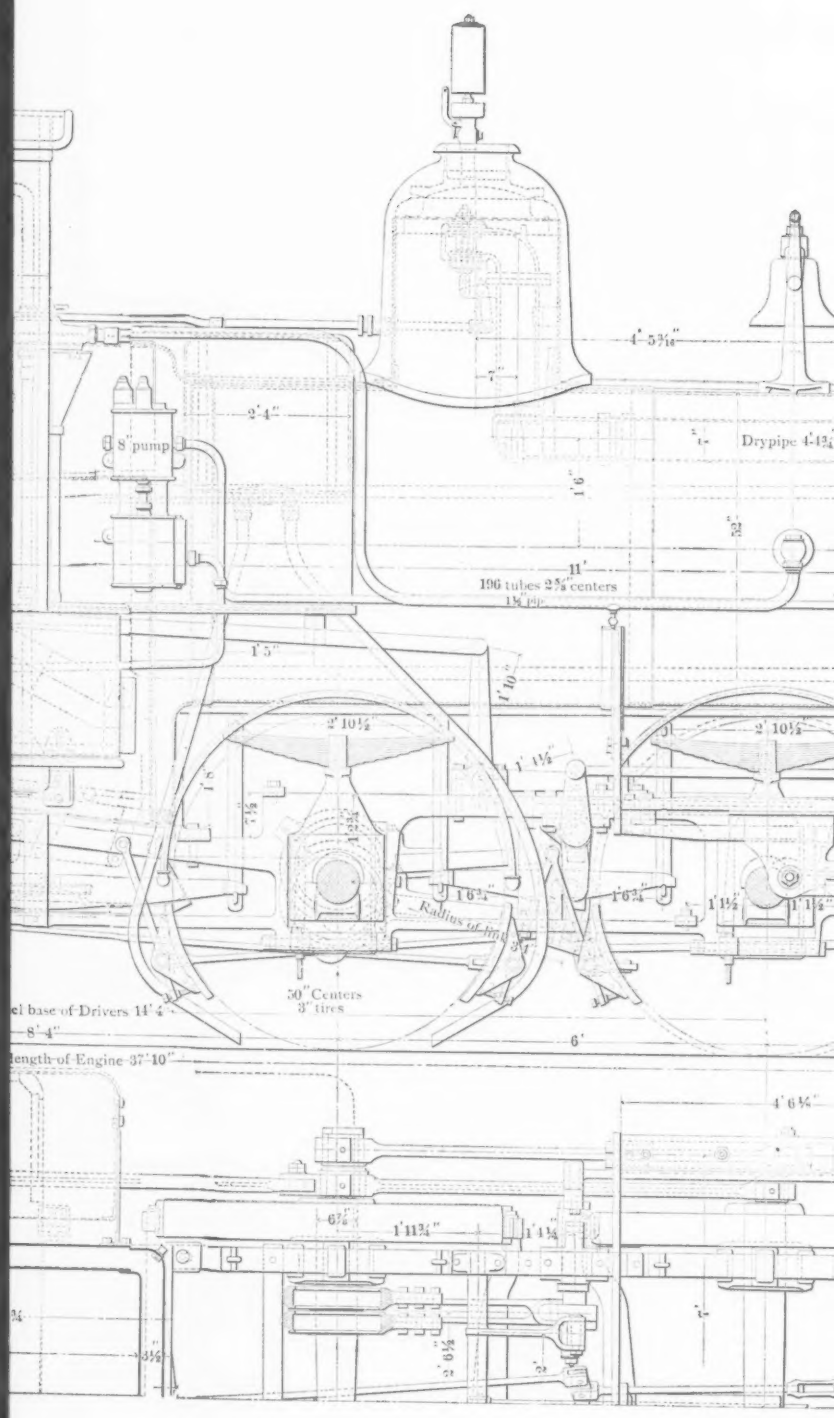
The necessity for trucks at both ends of a locomotive intended to run both ways is still somewhat disputed, but the preponderance of all experience goes to show that the drivers run ahead quite as safely as the truck when the rigid wheel base is small, and the truck at the rear is made with a swing motion or other device for allowing considerable lateral play.

The favorite type of suburban engine now in use is

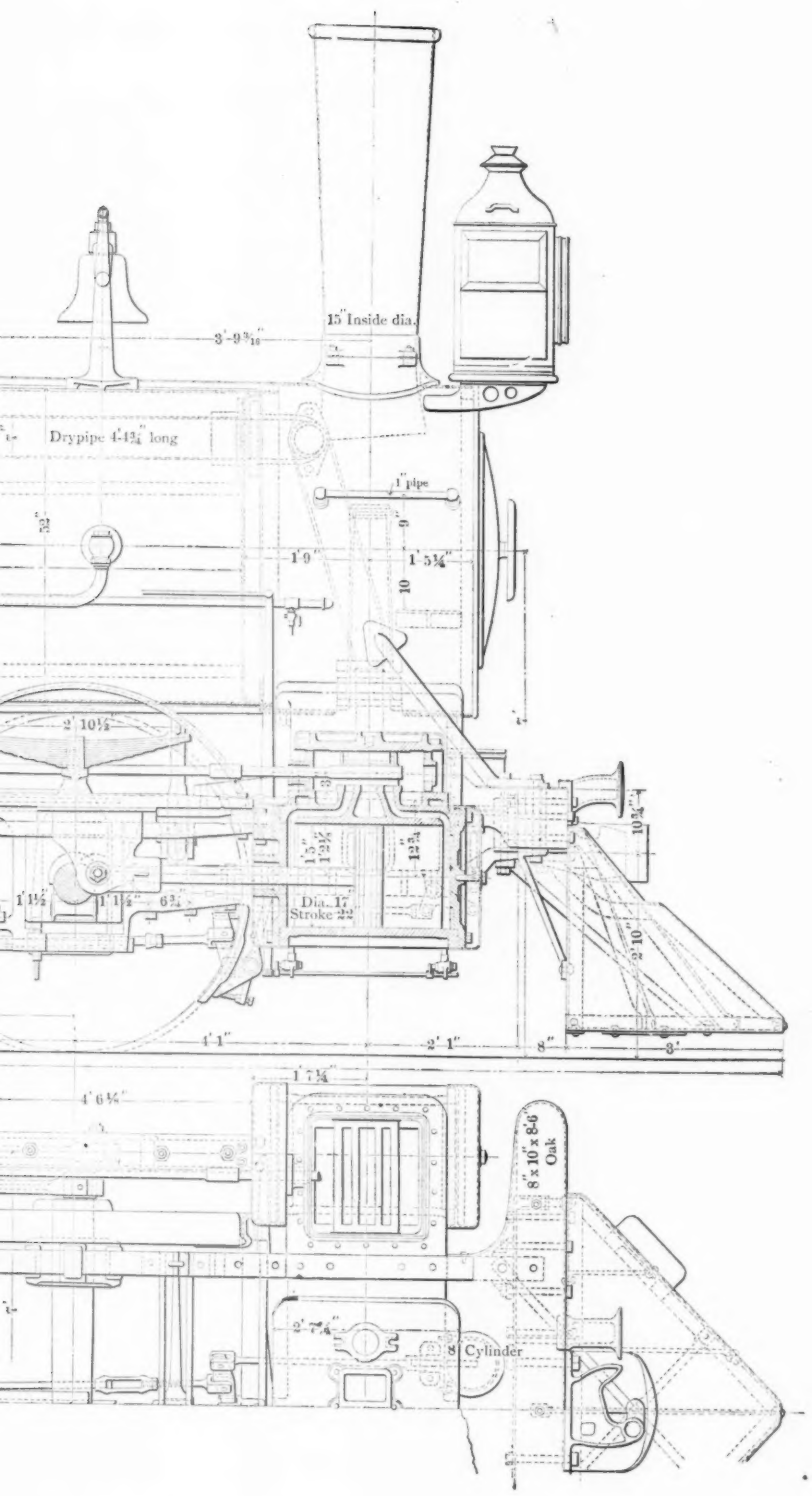
[Accompanying The Railroad Gazette, December 13, 1889.]



SUBURBAN PASSENGER LOCOMOTIVE, CLASS I—CH



E, CLASS I—CHICAGO, BURLINGTON & QUINCY RAILROAD.


15" Inside dia.
3'-9 3/16"
Drypipe 4'-4 3/4" long
1" pipe
1'-9"
1'-5 1/4"
2'-10 1/2"
Dia. 17
Stroke 22
1'-1"
2'-1"
8"
3'
1'-1 1/4"
4'-6 1/4"
8" x 10" x 8'-6"
Oak
2'-7 1/4"
8" Cylinder

TYPES OF LOCOMOTIVES FOR SUBURBAN PASSENGER SERVICE.

WHERE USED.	Type.	Cylinders.	Total weight of locomotive.	Weight on drivers.	Weight on truck.	Weight of locomotive and tender.	Pro of dead weight to total weight of engine and tender.	Pro. of dead weight to weight available for adhesion.
		In.	Lbs.	Lbs.	Lbs.	Lbs.	Per cent.	Per cent.
New York Elevated and Brooklyn Elevated	Light Forney	12 × 16	42,650	29,000	13,650	42,650	32	47
Various roads east and west	Heavy Forney	16 × 20	90,000	55,000	35,000	90,000	39	64
Old Colony	Heaviest Forney	17 × 20	109,300	62,300	47,000	109,300	43	75
Chicago & Evanston	4-wheel coupled and 4-wheel truck	18 × 24	160,000	64,000	36,000	160,000	60	150
Chicago, Burlington & Quincy	Class I.	17 × 22	113,000	94,000	19,000	113,000	17	20

the Forney, which generally has four drivers and a four-wheel truck. Strictly speaking, it is an eight-wheel engine with the trucks placed in the rear and the tank carried on a backward extension of the main frame. Locomotives are sometimes built according to this plan except with a two-wheel truck in front. Such engines are extensively used on the Illinois Central, which has one of the largest suburban services in the United States. Modifications of the Forney type are numerous, and the term has now been broadened by usage to cover designs differing considerably from the original.

Many attempts have been made to introduce saddle-tank locomotives for local work, but with small success. These have generally had a two-wheel radial truck in front and in the rear, but in some cases they have been built without trucks. The New York Elevated service is essentially suburban. In the beginning four-wheel saddle-tank locomotives adapted to run both ways were used with some success. Later, eight-wheel saddle-tank locomotives, having two-wheel trucks at both ends, were tried: but these were found to have insufficient capacity and were replaced by the Forney type, which is now the standard. It would have been possible, of course, to have increased the capacity of the saddle-tank engines, but they were found to be undesirable for reasons other than that of small capacity, particularly with respect to repairs to the trucks and the difficulty of reaching those parts of the locomotive which were placed under the tank.

It has been customary on many roads to relegate to suburban service the worn-out locomotive equipment from the longer runs, and we see a large number of old "American" (eight-wheel) locomotives running on local trains. In some cases, the Chicago & Evanston, for instance, new American engines have been built with the intent of placing them immediately on suburban work. To that end they have been fitted with pilots at the front and back, and with safety guards to prevent passengers from getting under the wheels.

In this issue is shown a new style of suburban engine, which compares quite favorably in point of dead weight with other locomotives, as can be seen from the description given. For some time past the Burlington officers have been carefully studying the problem of suburban locomotive service. They have had in view oil and gas engines, and almost every possible or conceivable type, and after a thorough investigation they have settled upon the type shown as being best adapted, in the majority of its features, of all designs studied for that class of work.

Local trains are, as a rule, lighter than those for long-trip service, and the dead weight of the tender and that on the truck of the locomotive bears a larger ratio to the total weight of the train than in a through train. In starting and accelerating trains the dead weight is more objectionable, and increases to a larger extent the total resistance of the train than when it is moving at a uniform high speed. Local train service, when satisfactorily performed, requires a high rate of acceleration in leaving stations, and for this reason unnecessary weight in the train is especially objectionable. Hence those locomotives will be best suited for suburban service, all else being equal, which have the least dead weight; or, what is the same thing, have the largest proportion of their weight available for adhesion. This point may be best seen from the table herewith, which contains the weights of various engines in proportion to the various train loads.

It is to be feared that the demands of suburban service are not fully appreciated, and that the possible losses resulting from the use of uneconomical engines are under-estimated. This service demands quite as much careful attention to obtain a reasonable degree of economy as through service, and it is not an exaggeration to state that locomotives worn out in the latter are as unfit for fast and heavy local trains as suburban engines would be for through trains. The magnitude of this service is increasing rapidly, and there is a growing tendency among business people to reside in the distant suburbs of large cities. On many roads this class of service includes more passengers, is more profitable and affects the comfort of more people than any other, and its peculiarities should therefore be well understood and its demands as nearly as possible fulfilled. Of course, there are other features of local train service rather than rapidity of movement, such as the car heating, and particularly car lighting, which demand the best attention of managers; but the satisfactory acceleration of the train is of prime importance in pleasing the passengers, and the economical performance of the engines is necessary to enable this to be done profitably.

Bridge Guard Rails.

On another page will be found a very intelligent discussion of some of the matters affecting the safety of bridge floors. We would like to give to our correspondent what he wants, a record of observed facts large enough and accurate enough to settle definitely some of the questions which must be in the mind of every unprejudiced man who thinks carefully on this subject: unfortunately, no such record has been made. In the absence of ascertained facts we must depend upon reason: but there are some fundamentals which are about settled.

Most intelligent engineers will doubtless agree with "Engineer" in the use of the inside guard rail, even if they, by forced economy, are compelled to do without it. They will also agree that this rail should be metal, either old rails, or timber faced with angle iron, or a heavy angle iron alone, arranged as may be seen, for instance, in the bridge floors designed by Mr. Morison. There can be no question that the guard rail should act on the inner wheels of a derailed truck, so that it will tend to swing the axle into a position parallel with the ties. If the derailed wheels first strike a guard rail or timber outside of the track the action must be directly the reverse, and the axles will be slewed around to a position more or less nearly parallel with the rails. The guard should be metal instead of timber, in order that the wheels should not bite into it: and the flange side of the wheel, and not the outside of the rim, should first strike the guard. These are the conditions least likely to lead the wheel to mount the rail. All of these things are now almost axiomatic. Like many other axioms, however, they must be often restated, and we must come back to them from time to time when discussing the general subject.

When we come to the arrangement of the guard rails there is more room for question. Doubtless there should be two rails, placed so far from the running rails as to allow wheels to drop between guard and running rails, and so near as to hold the derailed wheels close to line. Whether these rails should be brought to a point in the middle of the track, as in the familiar arrangement, or whether it is better to use a third rail in the middle, as in the Michigan Central floor, shown by us Nov. 1, it is more difficult to say. Indeed, this is a question which can only be positively answered after the study of many observed facts, if at all. The Michigan Central floor is certainly an admirable one in several particulars, although somewhat costly. The whole arrangement is very strong. The ends of the guard rails are securely protected; it is impossible for chains, brake beams or any low parts to catch on them. The three rails provide a way on which a car body stripped from the trucks can slide safely over the bridge. Whatever the position of the wheels when they enter the bridge, they will probably be guided over without getting further out of line. If the wheels are out of line by anything less than half the gauge they will be carried over in about the same position, while, if they are out of line by more than half the gauge, they will not necessarily be forced further out. It has always been one of the arguments against the ordinary arrangement of two rails, brought to a point in the middle of the track, that if derailed wheels took the point on the wrong side they would be carried over against the running rail and thrown out of line by the whole width of the gauge. The Michigan Central floor provides against this to a certain extent.

"Engineer," in his letter, makes the obvious answer to this objection to the ordinary arrangement. It will be said further that if wheels are out of line by half the gauge, couplings will probably part, trucks be stripped off, or the train be otherwise broken up, so that altogether it will be a matter of comparatively little consequence whether the wheels are carried further out of line or not. As a matter of fact, however, trains do hold together and are hauled on to bridges with truck wheels out of line by more than half the gauge. An instance happened very lately in which a train went on to a deck bridge with the flanges of the wheels close against the inside of one rail, and the other wheels either on the very ends of the ties or hanging over them. The cars tipped off and a bad wreck followed.

The fact is that no arbitrary arrangement of guard rails, not considering the bridge as a whole, is safe in all contingencies. The distance between trusses, width of cars, length of ties and position of bumper posts must all be considered, together with the guard rails. In some cases the use of outside guards, such as "Engineer" describes, will be really necessary to complete protection. The subject is not a simple one, and although certain fundamental principles are settled, the best details of practice are still to be determined by the light of known facts.

Kansas and Nebraska Rates.

Whether Mr. Walker and his associates will succeed in reforming the railroad tariffs to Kansas and Nebraska points is uncertain. The influences opposed to such a reform, outside of the Inter-state Commerce Railway Association as well as within it, make the task a hard one. But this is certain, that the board of arbitrators has given us an extremely able paper on the subject, which ought to bear fruit sooner or later, whatever be its fate to-day.

The history of the matter has been as follows: During the earlier period of railroad development Omaha was treated as the distributing centre for the state of Nebraska. It was the competitive point *par excellence*, doing a larger business and receiving lower rates. In Kansas, there was no one dominant Missouri River point: but four cities received rates which placed them on a footing of substantial equality with one another. These were Kansas City, Atchison, Leavenworth and St. Joseph. A system of rates was thus established under which these points acted as distributing centres; receiving goods from the East on specially advantageous terms and reshipping them in smaller lots to places in the interior.

Such a state of things could continue only so long as the Missouri River formed a sharp dividing line between railroad systems east and west. When the Northwestern and the Burlington built their lines across the river, competitive points arose in the interior of the state, receiving direct shipments from the East at low rates, and ready to dispute the claims of Omaha as the leading distributing centre. Such are Lincoln and Fremont, both of which, and especially Lincoln, enjoy great advantages under existing rates.

Interior competitive points in Kansas have not enjoyed the same special advantages as Lincoln or Fremont, at least not until a recent decision of the Kansas Commissioners goes into effect. But this has not made the situation in that state less complicated. Each of the roads to the Missouri River was all the time trying to extend the area of its business, and wished to compete with its rivals on terms as nearly equal as possible. The practice has prevailed of maintaining identical rates from all, or nearly all, Missouri River distributing points to junction points in the interior of Nebraska and Kansas, without regard to distance. This custom has been carried to such an extreme that points in the immediate vicinity of one of the Missouri River cities have obtained the same rates from all: and at times rates have been made in this manner over lines where their participation involved serious reductions at intermediate points, with considerable unnecessary loss of revenue. Whatever losses had arisen in this way became all the greater the more thoroughly the short-haul clause of the Inter-state Commerce act was obeyed.

For any reform of tariffs the abandonment of this custom was the first requisite. "It is hard to see," the arbitrators say, "upon what ground the factor of distance should not receive its proper consideration in these cases; and the adoption of a general and consistent principle, while operating in some measure to exclude those towns from regions of distribution situated nearer

other towns of like character, nevertheless presents each, by way of compensation, with more exclusive control of other territory in which their opportunity is now only competitive. The points reached are not injured by a readjustment that involves merely the putting of the rates from all points upon a proper basis, for they continue to receive the lowest rates to which they are entitled from the nearest distributing point. In the preparation of the tariffs an effort has therefore been made to adjust the rates from the different Missouri River towns as among themselves, not upon a strict mileage basis, but upon a general plan applied throughout the states in question, under which, for example, in Nebraska the rate is usually higher from Kansas City than from Omaha; in Kansas this is reversed, and the rate from Omaha is higher than from the southwestern Missouri River points. In like manner, the more southern points of distribution in Kansas are given a relative advantage in the southern districts of that state, and put at a relative disadvantage in the northern part.

Such a division of the field is an indispensable condition for any settlement of the question. If it can be honestly carried out, it is to the advantage of the railroads and the public alike, because it enables the various districts to be supplied by the routes which can do the work at the least cost. This ought to succeed even if the other proposals fail. But it does not by any means touch the most perplexing of all questions, the relation between through and local rates as such.

Under the traditional system of rates we had consignment of goods from the shipping point to an interior distributing centre, and thence a relatively short shipment to destination. There was thus a marked separation between through and local business, the former being handled in larger bulk, with more regularity, and at correspondingly lower rates. Unfortunately, the difference in rates was not confined within proper bounds. The local business had good grounds to complain of unfair treatment. To remedy this the short-haul clause of the Inter-state Commerce law was enacted. This materially lessened the advantages of minor trade centres. What formerly they had secured with ease they could now retain only by a struggle, since direct shipment to destination had become so much easier. In this struggle they sought help from the state authorities. As the Inter-state Commerce Commission well remarked, the question of rates is often one between rival localities rather than between shippers and railroads as such; but it is carried on in such a way that the railroads suffer, whoever wins. The local shipper tries to have his rates reduced to the level of the through ones; the trade centre tries to maintain its ancient advantage by a corresponding reduction in the through rate.

Such a course cannot go on indefinitely without disaster. The paper before us is important as a serious effort to put an end to this state of affairs. It will probably meet with much opposition from the trade centres, but it seems, on the whole, equitable. The arbitrators begin by arranging the proportion which the rates in the various classes should bear to class "I." In this respect there had been a good deal of divergence; rates for intermediate classes at points near the Missouri River being abnormally low. The arbitrators have tried to make an estimate of the average practice and adopt this as a standard. Starting on this basis, they have adopted a local tariff, which is substantially a distance tariff; though in certain cases where a shorter competing line fixes the rates such a result is impossible.

The maximum difference which may prevail between a through rate, and the sum of two locals which go to make it up, is fixed at 10 cents per 100 lbs., first-class. The arbitrators believe that this can be applied in most localities. At Lincoln and some other Nebraska points they are disposed to make an exception, and allow a somewhat lower through rate than this principle would warrant. The simple reason is, that Lincoln has come to have what is almost like a vested interest in the distributing trade of certain parts of Nebraska; and any system of relative rates for Lincoln and Omaha which should disturb this balance would cause such opposition as to be wholly impracticable. The arrangement proposed for Lincoln rates, like many other parts of the proposed plan, is a makeshift, based on what the traffic will bear. This phrase really describes the way in which railroad rates are adjusted to-day about as much as it did a few years ago. The only difference is that under the old system the question was decided without much regard to anything but railroad interests, while under the new system railroad interests are hardly considered at all. From a public standpoint, neither extreme can be regarded as satisfactory.

Lake Ore Trade and Shipping.

The *Iron Trade Review* reports the receipts of iron ore at Lake Erie ports as follows:

	1889.	1888.
Iron ore on docks at Lake Erie ports at opening of navigation, in gross tons.....	558,735	703,720
Total receipts.....	5,314,112	3,783,659
Total.....	5,872,865	4,487,379
Shipped by rail during the two seasons...	3,265,759	2,638,824
Left on docks at close of navigation.....	2,607,106	1,848,555

The sales for lower lake delivery during the shipping season of 1889 were 5,411,412 tons, as against 4,366,359 during the corresponding season of 1888. The total shipments by lake from Lake Superior ports for 1889 were 6,804,511 tons, against 4,621,947 tons in 1888, an increase of 47.2 per cent. of this year's output. 1,289,000 tons, or about 20 per cent., went to Northwestern points. The shipments by ports were:

From	Marquette	1,376,335 tons.
"	Escanaba	3,003,632 "
"	St. Ignace	51,843 "
"	Ashland	1,484,802 "
"	Two Harbors	819,639 "
"	Gladstone	68,250 "
	Total	6,804,511 tons.

The growth of this trade has been almost phenomenal; the receipts at lower lake ports for this year having been more than twice those of 1886, and more than three times those of 1885; and it seems that another material advance is to be made in 1890, for of the estimated output of 9,000,000 tons, 3,000,000 tons have been disposed of at an advance over this year's prices of from 75 cents to $1.25 per ton. This is due greatly to higher Atlantic freights, and the fact that English and Continental iron masters have engaged nearly the entire output of the Spanish and Mediterranean mines, leaving us no resource of consequence outside the United States except Cuban ores. In the meantime our supplies of pig iron are constantly diminishing, and it is doubtful if a stock equal to two weeks' consumption is at present on hand. It is noticeable in this connection that, as the *Iron and Steel Trades Journal*, of London, says, "Prices [in America] do not move in sympathy with advances here, and for the first time in the history of the American iron trade their markets seem quite independent of ours;" while "on the Continent the prices are advancing rapidly, the increased cost of the iron supplies from England and Scotland have been followed by a rise in the native pigs, and manufactured iron and steel is advanced in proportion."

The total through shipments, neglecting the local traffic and the lumber trade, representing a traffic of many millions, have been approximately 112,000,000 bushels of grain from Chicago and Duluth, 6,800,000 tons of iron ore, and 4,200,000 tons of coal up the lakes. The large vessels have paid their owners from 12 to 15 per cent. during the past season. The *Chicago Tribune* estimates the freight earnings on grain at $3,120,000; coal, through Chicago only, $2,400,000; iron ore, $8,500,000.

During the last three years the tonnage of the lake marine, which now represents an aggregate capital of $53,000,000, has doubled, though, on account of the substitution of steam for sails and of steel for wood, the increase in capacity for transportation has been greater. Contracts for the construction of 41 new vessels are now in the hands of the lake builders, involving a cost of $5,500,000.

The losses on the lakes have reached a value of about $1,500,000, but no passengers have been lost, and only 23 sailors.

The Muscle Shoals Canal.

The obstructions known as the Muscle Shoals, in the Tennessee River, which covered about 23 miles out of the 453 between Chattanooga and Paducah, at its mouth, are at length overcome by means of locks and dams built by the general government, and the river is now open so that boats loaded at New Orleans can at all times proceed to Chattanooga, and most of the time to Knoxville. The distance from Chattanooga to New Orleans is 1,601 miles, as against 2,067 from Pittsburgh and 1,567 from Cincinnati, and it is claimed the coal freights from Chattanooga to New Orleans will be between 80 and 90 cents, as against $1.05 from Pittsburgh.

The improvement of this short piece of the river has been more or less under construction for 60 years, the first government appropriation for it having been made in 1827. About this time work was undertaken under state auspices, so that the general government expended less than $52,000 up to 1860, and no interest in the country received benefit from the insufficient attempts then made to improve the channel. In 1871 work was commenced with an appropriation of $80,000, and work was continued with considerable regularity until 1883, when, by the failure of the River and Harbor bill, the engineers in charge of the work found themselves, after an expenditure of two and a quarter million dollars, tied up for a year with only $23,000, and the work was tied up again through failure of appropriations for 1885.

A private company or a government conducted on economical business principles would have completed the improvement in 1876 or 1877, saving the country the increased cost of continuing the work through the 10 or 12 additional years and the large capital sunk in interest, and would have gained the development of resources resulting from cheaper freight.

The saving in freight charges on the iron carried on the first boat down was reported at one dollar a ton between Sheffield and St. Louis.

Second-class, or "tourist," sleeping cars, which have been the subject of discussion at Trunk line meetings for several months, have finally been banished to the Western wilds (beyond Chicago), and a dispatch from Chicago reports Mr. Pullman as congratulating himself on the removal of a threatening competition. These cars have been run in weekly excursions over the Erie, and in similar service from Baltimore over the Baltimore & Ohio, the latter carrying transcontinental passengers to New Orleans. They have also been run on the Canadian Pacific. It does not appear that they have as yet caused any serious demoralization of first-class traffic, but it is no doubt for the purpose of guarding against this that the Trunk lines have agreed not to use these cars. Plain sleeping cars with attendance at low cost unquestionably meet a demand which is destined to grow, if it has a chance. Cars without upholstery and without porters were first used for emigrant travel, but, as most people know, they soon were availed of by a better class of passengers, and their use for traffic which is to all intents and purposes first-class, except in rates, is now common west of Chicago. There has not been such a marked demand by emigrants for sleeping cars east of Chicago as in the West, because, first, the trip is shorter and less fatiguing than most of those in the West, and, second, because a large share of the emigrants leaving the seaboard are people who have just emerged from the steerage of an ocean steamer, and who therefore regard a ride to Chicago in a "sitting-up" car as a luxury. Undoubtedly the unrestricted use of these cars would in a short time add a new class to the passenger trains of the trunk lines, and, by competition, make all the classes necessary on all the roads, thus increasing the cost of carrying the passengers; and the trunk lines, no doubt, act wisely in staving off this additional expense, for the present at least. But the furnishing of a place for passengers to lie down in comfort, as distinguished from the facilities of a day car in which one must sit up in discomfort, when making a 30-hour trip, is such a natural and sensible expedient for winning patronage, especially when it can be done without a great sacrifice of economy in car space that the present repressive measures cannot with certainty be regarded as permanent. There are people who would pay $2 a berth for a 1,000-mile ride, but who cannot or will not pay $6; and this demand could, with proper care, be catered to without greatly injuring the first-class business; but, unfortunately, innovations like this are not likely to be started except by people who fully intend to injure *somebody's* first-class business.

The rush of traffic seems to have lightened on the Northwestern roads sufficiently to give the traffic men a little breathing spell. At least we so judge by the resumption of the familiar despatches concerning reductions and rumors of reductions. During the past week the Chicago, Burlington & Northern has given notice that it will reduce grain rates from St. Paul to Chicago from 10 cents to 7½ cents, and also that it will withdraw from the Western States Passenger Association. It is claimed that other roads do not report to the Association all their passenger contracts, and that grain rates have been secretly manipulated. The notice of freight reduction was suspended the day after it came out, an agreement having been arrived at to bring the matter before the whole Association. The Minneapolis, St. Paul & Sault Ste. Marie proposes to reduce passenger rates from St. Paul to the East, which it maintained at a low rate for some time, but restored to the agreed basis a month ago. The Alton threatens to reduce live stock rates from Kansas City.

About 40 of the 75 firemen on the Southwestern of Georgia struck last week because a rule was issued forbidding brakemen to assist in firing. Collisions had occurred because brakemen were not at their posts. Most of the engines burn wood, and the strikers claim that their trips are so long and their loads so heavy that it is impossible to do the work without the assistance of a man to pass wood. Negro firemen, put on in the place of strikers, were interfered with by the latter, and the track was greased in several places so as to prevent the running of trains, but the company succeeded in getting new men, and the reports indicate that the strike will fail. Seven of the principal strikers were arrested and sent to jail. The pay of the men has averaged $1.50 to $2 a day, 12½ cents per hour being allowed for extra work. The superintendent says that the work is easy, while the men claim that it is very hard, asserting that some trips occupied 30 hours.

Mr. John H. Bonn writes to the New York *Tribune* proposing an elevated double-track belt road through Chambers, West, and Liberty streets, Maiden lane, and thence north on South street to the starting point. The proposition is to have some 18 stations on a length of two and a half miles; the road to be operated by cable, or other device not requiring locomotives, and to be about 40 feet above the surface of the streets; the passengers to be carried in elevators to the level of the rails. This is a step in the way of the long-desired belt railroad for New York city, and contains a possible germ of development, in that the cross-town roads would form valuable feeders

to any such enterprise, as passengers reaching the city by ferries might find it more convenient to take a road along the water front, and then do their walking from one of the cross-town stations, than to walk first to get a car, and then to get to their destination as at present.

It appears that the new State of North Dakota is to solve the railroad problem, at least so far as concerns one of its principal difficulties, in short order. A bill has been introduced in the Legislature empowering the railroad commissioners to "compel railroads to furnish cars to any one for shipment of wheat."

TRADE CATALOGUES.

The Brown & Sharpe Manufacturing Co., of Providence, R. I., issues a handsome supplement to its regular catalogue, containing fine illustrations of its universal and plain milling machines, grinding, gear-cutting, tapping, screw and screw-slotting machines, hand lathes, annealing furnaces and other manufactures. The regular catalogue of the company is of pocket size, and this supplement is issued for the purpose of showing pictures of complicated machines too large for printing in the smaller issue. It is sent on receipt of 15 cents.

The Temperature of the Fire Surfaces of Boilers.

A recent number of the *Annales du Conservatoire des Arts et Métiers* contains an account of an elaborate series of experiments on this subject by Mr. Hirsch. The matter is so important to all those who use steam machinery that a summary of this paper (which was briefly noticed in the *Railroad Gazette*, Nov. 22, 1889), will doubtless be interesting.

Overheating occurs when a sheet becomes red hot over a portion of its surface. The circumstances which cause overheating are not well determined. If heat is transmitted through a metallic plate in contact with water on one side, it seems difficult to cause overheating on the other side, so that the hypothesis of low water is usually advanced. Really, in a case of this kind, there are three points to be considered: The rate of conduction of heat to the plate, the rate of heat transmission through the plate, and the rate at which the plate imparts its temperature to the water. It seems certain that, under ordinary conditions, the external surface of the sheet has a much lower temperature than the fire or products of combustion in contact with it, and that the interior surface has a temperature not much greater than that of the water in the boiler; so that the most serious obstacle to the transmission of the heat to the water is the resistance of the plate.

Three sets of experiments were made:

1. Evaporative tests at portions of the boiler exposed to direct flame.

2. Experiments on the transmission of heat through the boiler plates and from the plates to the water.

3. Examination of the effect of scale and grease.

The evaporation of a boiler is frequently measured by the hourly rate in pounds per square foot of heating surface, but this only gives the average result, while the rate of evaporation varies greatly for different portions of the heating surface. Experiments made with a locomotive boiler on the Northern Railway of France, the boiler being divided into several sections, showed a rapid decrease in the rate of evaporation as the distance from the furnace increased, so that the tubes at their extreme ends scarcely evaporated any water, at moderate rates of combustion. The furnace sheets and a small portion of the contiguous tube surface, forming the first section, evaporated at the rate of 44.6 pounds of water hourly per square foot of heating surface.

It is difficult to define the intensity of a fire. If it is estimated by the hourly rate of evaporation per unit of heating surface, no comparison can be made between boilers of different types, since the limiting figure for one boiler might not be suitable for another. It seems certain that the only parts where overheating is to be feared are the furnace and adjacent surfaces, and if a boiler is forced to a dangerous extent, and the tubes are lengthened without reducing the rate of combustion or making any other change, the average rate of evaporation will be diminished, without in the least diminishing the danger to overheating of the surfaces exposed to direct flame.

In Mr. Hirsch's experiments the amount of heat transmitted by the plates just above the bridge was measured in a stationary boiler set in brick. A metallic cylinder was fastened to this plate, isolating a surface of about 16 sq. in., and the evaporation in this cylinder was measured by a glass gauge suitably disposed.

A large number of experiments were made, burning coal at various rates, from 16.4 to 48.7 lbs. hourly per square foot of grate surface, and giving evaporative rates, for this special surface, varying from 16.4 to 50.2 lbs. per square foot hourly. The average hourly rate of evaporation, measured for the total heating surface of the boiler, varied from 9.6 to 19.3 lbs. per square foot. These rates of combustion and evaporation are largely above the ordinary practice with stationary boilers, and the author concludes that the hourly rate of combustion per square foot of grate surface, in boilers of the type used in his experiments, ought not to exceed 28.5 lbs.

In the second series of experiments, a wrought-iron plate was subjected to intense heat on one side, the other side being in contact with water, and measurements were made of the quantity of heat passing through the plate, together with the temperature of its external surface.

A circular sheet of wrought iron about 16 in. in diameter and $\frac{5}{16}$ in. in thickness was attached to a copper cylinder, forming an open-topped boiler and set in a furnace of fire clay. Heat was applied by a large blow pipe, burning gas with a blast. The evaporation was measured by weighing the amount of distilled water which it was necessary to introduce for the purpose of maintaining the water level constant. The temperature of the plate was measured indirectly by preparing fusible alloys whose melting points were known, and placing plugs made of these alloys in holes bored in the plate. After each experiment, the bottom of the boiler was examined; and some of the plugs being melted while others were intact, the limits between which the temperature of the plate had been maintained could be approximated. The melting point of the alloys was checked by experiment for those which melted below 572 degrees Fahrenheit. Above this point lead and zinc were used, estimated to melt at 634 degrees and 842 degrees respectively. These temperatures, especially the latter, are somewhat uncertain.

The water evaporated by this apparatus was reduced to equivalent evaporation at 212 degrees from feed at 32 degrees Fahrenheit per square foot of surface hourly, which is called the *evaporative rate*. The following is a summary of the results obtained:

As the evaporative rate increases, the difference between the temperature of the external surface of the plate and the temperature of the water on the other side of this plate rises progressively. The difference for an evaporative rate of 41 lbs. is 212 degrees, and does not exceed 302 degrees even when the evaporative rate is increased to the high figure of 61 lbs. This is an important and reassuring fact, showing that even with very high evaporative rates the temperature of the external surface of the plate can never exceed 536 degrees. Hence it does not seem probable that there is any danger, in practice, of overheating a boiler plate in an unbraced or unthickened part, if the metal is sound and well moistened with water. But danger may exist if for any reason there is any obstruction to the transmission of heat, either through the plate or from the plate to the water.

The preceding experiments were made with distilled water. They were repeated, using water thickened with starch. Two sets of experiments were made, one with water containing .002, and the other with water containing .005, by weight, of starch.

With water containing .002 of starch, the temperature of the external surface of the plate was increased about 27 degrees.

Water containing about .005 of starch is much thicker and its ebullition is much more violent. The temperatures of the plate were but slightly increased above the preceding. This quantity of starchy matters is rarely used to remove scale, so that the use of starch does not seem liable to cause overheating.

Several experiments were made after covering the plate on the interior surface with thin coats of plaster of Paris. For a thickness of 0.04 in. the temperature of the external surface was about 54 degrees higher than was found for the plate in direct contact with distilled water. Coating the plate to a thickness of 0.2 in. its external surface had a temperature of 450 degrees for an evaporative rate of 32 lbs., and a temperature of 720 degrees for an evaporative rate of 41 lbs. These figures are, respectively, 63 and 378 degrees above the temperatures obtained with clean plate in contact with distilled water. They show clearly the bad effect of incrustations.

To determine the effect of changes in the thickness of a plate, due to seams or deposits, a sheet of steel, 0.2 in. in thickness, was soldered to the plate. The temperature of the external surface of the plate was increased 90 degrees for an evaporative rate of 21 lbs. and 126 degrees for an evaporative rate of 61 lbs.—over the temperature obtained with the plain plate. This seems to indicate that there is some danger in exposing riveted seams to the contact of an intense flame.

Experiments made with a double bottom, having talc interposed, showed that for an evaporative rate of 32 lbs., the temperature of the plate exceeded 630 degrees, and that for an evaporative rate slightly greater the temperature exceeded 842 degrees, indicating that overheating was imminent. This is a clear proof of the danger of deposits in the vicinity of the furnace.

An attempt was made to determine whether the masonry setting at a high temperature could overheat the adjacent plates, but the results of the experiments did not justify this hypothesis.

The third part of Mr. Hirsch's report is devoted to experiments on the effect of coatings of grease. The heated surface was covered with grease internally, and it was found that its external surface had a much higher temperature than in the case of a clean plate; but when the intensity of the fire was increased, some special facts were noticed.

The difference of temperature between internal and external surfaces is 90 degrees above that of the clean plate, for an evaporative rate of 32 lbs., and more than 300 degrees for an evaporative rate of 51 lbs., producing a dangerous degree of overheat in the latter case. In other experiments, even at moderate evaporative rates, not exceeding 35 lbs., the temperature of the external surface of the plate was 856 degrees, greater than the melting point of zinc.

To determine the reason for these different results, experiments were made with tin vessels exposed to direct flame. It was observed that these vessels, when coated with grease on the interior and filled with water, became red hot in some cases, even with a moderate fire; and it was concluded that the nature of the grease modified the results. The following is a summary of the facts observed with different oils and greases.

Mineral oil, when applied thinly, produces no appreciable effect; but it causes overheating after being decomposed by heat. A chip soaked in mineral oil and applied to the plate causes overheating.

Linseed oil, even when very thinly applied, causes a rapid overheating of the plate at the moderate evaporative rates of from 21 to 25 lbs.

The same is true of *red lead putty*. If a ball of this material is flattened against the plate, the latter will become red hot even with a moderate fire.

Rapeseed oil acts in the same manner as linseed oil, but does not produce quite so rapid an effect.

Valvoline does not cause overheating, except at a high evaporative rate, say 72 lbs.

Lard oil causes overheating, even when mixed with a considerable quantity of plumbago. If the plumbago is greatly in excess, the metal does not become red hot.

Tar, applied to a tinned or polished surface, becomes detached when the water boils. If applied to a rusty plate it adheres better, but does not cause overheating.

Mr. Hirsch draws the following conclusions from his experiments:

1. A sound and continuous sheet, in contact with water on one side, never acquires, however intense the fire may be, a temperature sufficiently high to sensibly decrease its strength.

2. The viscosity of the water, even when considerable, does not lessen its refrigerating action.

3. The transmission of heat is more or less affected by riveted seams, and such seams should not be exposed to an intense fire.

4. A diminution of thickness in a plate, caused by a flaw or crack, or a lack of close contact between two sheets at a seam, is a grave cause of danger, even with moderate fires.

5. The contact of the masonry setting even at a very high temperature is not dangerous if the plate is continuous and in contact with water on the other side.

6. Any grease or oil on the internal surfaces is a serious obstacle to the transmission of heat.

7. When the oil or grease is decomposable by heat, overheating is particularly to be feared. The organic oils, linseed, rapeseed, etc., appear to be more dangerous in this respect than the mineral oils.

Finally, it may be concluded that a boiler, well set, carefully managed, clean and containing a full supply of water, is not liable to be burned, even with an intense fire, but that with rapid combustion it is essential to take proper precautions for the purpose of avoiding anything which might interfere with the transmission of heat through the metal and from the metal to the water.

As an appendix to these interesting experiments, the reader may be interested in a summary of some observations made by Mr. Franz Schwackhoefer, of Austria, on mash and hop kettles, measuring the temperatures at various points, both internally and externally. The mash kettle was made entirely of copper, the sides of the hop kettle were of iron, and the bottom partly of iron and partly of copper, and observations were made on a third kettle, composed entirely of iron, and used for boiling both mash and hops. Twelve different fusible alloys, composed of tin, lead and bismuth, and having melting points varying between 230 degrees and 378 degrees Fahrenheit, were prepared. Plates were cast from these alloys, each 2 × 0.6 in., and 0.06 in. thick. Some of these plates were placed within the kettles at the desired points, and others were soldered to the exterior, at the same relative points. The melting points of the alloys were measured by a thermometer in paraffine, the greatest allowable difference between any two samples of the same alloy being 3.6 degrees, and the assumed melting points being the averages of from 3 to 6 observations for each alloy. The material in the kettles was ordinarily agitated by chains, during the operation of boiling, but these were removed for the experiments, so as not to interfere with the internal test plates, and revolving stirrers were substituted.

The results of the observations are tabulated below:

TEMPERATURES OF KETTLES, EXTERNAL AND INTERNAL SURFACES, IN FAHRENHEIT DEGREES.

Copper mash kettle.

Situation of test plate.	Temperatures of surface of kettle. External.	Internal.
Immediately over the furnace	329-342	246-257
At entrance to flue	266-275	239-246
At end of flue	257-266	230-239

Hop kettle, copper and iron.

Above the furnace (copper)	Above 378	257-266
Near the flue (iron)	No test plates.	239-246
At entrance to flue (iron)	275-286	239-246
At end of flue (iron)	266-275	230-239

Iron kettle.

Above the furnace	All the test plates melted.	246-257
At end of flue		239-246

TECHNICAL.

Locomotive Building.

The Brooks Locomotive Works are building eight ten-wheel and five passenger engines and also two six-wheel switching engines for the Cincinnati, Washington & Baltimore.

The Kentucky Central has ordered five new engines of the Schenectady Locomotive Works. Four are to be freight engines and one a switching engine.

The Salt Lake & Eastern is having built for its road five large freight engines at the Baldwin Locomotive Works, and two passenger locomotives are being built by H. K. Porter & Co., of Pittsburgh. Two 40-ton Shay engines will also be used on the road.

The Pittsburgh Locomotive Works will probably secure the order of the St. Louis, Vandalia & Terre Haute for five new passenger engines, but the contract has not yet been definitely awarded.

Car Notes.

The Michigan Car Co., of Detroit, Mich., is building 300 freight cars for the Flint & Pere Marquette, to be delivered by Feb. 1.

Haskell, Barker & Co., of Michigan City, have been awarded the contract to build 500 cars for the Columbus, Hocking Valley & Toledo.

The Pullman Palace Car Co. has nearly completed a number of new vestibule parlor cars for the Philadelphia & Reading.

The South Baltimore Car Works have an order from the Cincinnati, Washington & Baltimore for 650 cars.

James Harris & Co., of St John, N. B., are building a number of the frost-proof freight cars for use on the New Brunswick road. The car is the invention of C. Henry Kimball. The patents are controlled by the Frost-proof Car Co. The cars were used in an experimental way in Canada last winter, it is said with much success.

The Ohio Falls Car Works is turning out 28 cars each day, chiefly for the Pennsylvania Co. and the East Tennessee, Virginia & Georgia.

Articles of incorporation have been issued in Illinois to the Columbia Buffet Stock Car Co., of Chicago, to build and operate cars for the transportation of live stock and merchandise. The capital stock is $500,000. The incorporators are: Samuel Larsarns, Henry W. Gresswell, Albert Bush, Jr., Henry S. Boise and John A. Lee.

Bridge Notes.

The Board of Engineers appointed to investigate the plans for the proposed bridge across the Ohio River at Ceredo, W. Va., held sessions last week. The Norfolk & Western submitted plans for a bridge with four spans, the river span being 550 ft. long.

The bridge of the Pennsylvania, Poughkeepsie & Boston over the Lehigh River below Slatington, Pa., has been completed, and trains are now running over it.

The Fulton County Commissioners have asked proposals until Feb. 5 for constructing an iron bridge over the Chattahoochee River between Fulton and Cobb Counties, Ga. The bridge is to consist of two spans of 150 ft. each and 400 ft. of trestle work, and to rest on masonry piers and abutments.

B. C. Martin, of Anderson, Ark., will receive proposals until Dec. 17 for the construction of a new bridge across the Rocky River.

The Savannah, Americus & Montgomery will build a new bridge in Americus, Ga.

H. L. Detwiler is building two iron bridges, one at Chihuahua and the other at Leredo, for the Mexican Central.

The wooden bridge of the Lake Shore & Michigan Southern over Spy Run, one mile north of Fort Wayne, Ind., was destroyed last week by fire, and will be replaced by an iron bridge.

The contract to build a new bridge across the Little Red River at Judsonia, Ark., has been awarded to J. H. Browning.

The Great Northwest Central is asking the city of Brandon, Man., for a bonus of $30,000 to aid in building a bridge across the Assiniboine River at that place.

A project to build an iron drawbridge across the canal between the present Black's and Wellington bridges, Montreal, is being agitated, and may be carried out next spring. The structure will be about 200 ft. long and 50 ft. wide, and will cost about $10,000.

The Northern Central is about to erect two new bridges between Freeland and New Freedom, in Maryland.

The Secretary of War has consented to hold in abeyance the order issued by his predecessor requiring the immediate reconstruction of drawbridges across the Charles River at Boston to give a wider channel. A board of engineers will examine and report upon the alleged obstruction to navigation. The Boston & Maine Railroad is interested, and had made a remonstrance, two or three of the bridges being in the midst of its busy freight and passenger yards.

New bids were opened by the Denver Board of Public Works last week for the bridge over Cherry Creek at Larimer street. The following proposals ware received: Pittsburgh Bridge Co., Pittsburgh, $16,896; Kansas City Bridge & Iron Co., Kansas City, $15,949; Lane Bridge & Iron Works, Chicago, $14,792; Wrought Iron Bridge Co., Canton, O., $16,300; Bullen Bridge Co., Trinidad, Col., $16,489; King Iron Bridge Co., Cleveland, $15,849; Milwaukee Bridge Works, Milwaukee, Wis., $16,950; G. E. King Bridge Co., Des Moines, Iowa, $16,485; Penn Bridge Co., Beaver Falls, Pa., $17,485. The board recommended that the bid of the Lane Bridge & Iron Works at $14,792 be accepted, that being the lowest bid. When the bids were previously opened the board recommended that the bid of the Lane Bridge Works be accepted, but the city council refused to concur. The council has not yet acted upon the present recommendation.

The Commissioners received 15 bids for building the iron bridge over the Cumberland River above Pineville, Ky. The contract was awarded to the King Iron Bridge Co., which is now building a bridge over the Cumberland River at West Pineville. The following bids were opened: Wrought Iron Bridge Co., Canton, O., $14,600; Smith Bridge Co., Toledo, O., $14,150; Massillon Bridge Co., Massillon, O., $14,500; Lane Bridge & Iron Co., Chicago, Ill., $14,573; King Iron Bridge & Mfg. Co., $13,500, $14,000, $14,500, $13,800; Mt. Vernon Bridge Co., Mt. Vernon, O., $14,875, $14,540; Youngstown Bridge Co., Youngstown, O., $14,800; Indiana Bridge Co., Muncie, Ind., $14,000; Pittsburgh Bridge Co., Pittsburgh, Pa., $15,900; Champion Bridge Co., Wilmington, O., $14,475; F. J. P. Brackett, Cincinnati, O., $14,927; Milwaukee Bridge Co., Milwaukee, Wis., $14,714, $15,174; F. M. Stems Co., Michigan, $15,982.62; Queen City Bridge Co., $15,200; Penn Bridge Co., $15,500, $15,900, $16,000.

Manufacturing and Business.

The Deane Steam Pump Co., of Holyoke, Mass., is to build a large factory and foundry by which it will double its present capacity. The company now employs 350 men.

During the month of November, C. B. Hutchins & Sons, of Detroit, received orders for roofs for 550 refrigerator cars, 1,000 new box cars, 200 new stock cars, and 883 roofs to be used in replacing the worn outroofs of old cars, a total of 2,643 for the month.

The Spiral Weld Tube Co., of East Orange, N. J., intends to double its mill capacity. It has under contract machines which will turn out 7,150 ft. per day.

A. B. Bowman, of St. Louis, has just filled an order from the St. Louis, Alton & Terre Haute for a large complement of tools and machinery for the shops at East St. Louis, consisting of engine lathes, bolt-cutting machinery, steam-hammer, radial drills, slotter, car wheel boring machine and screw machines.

The Southern Railway Equipment Co. has been organized in Georgia by A. W. Smith, W. T. Spalding and others, to deal in railroad supplies and equipments.

William Tod & Co., of Youngstown, Ohio, have an order from Carnegie, Phipps & Co., Limited, of Pittsburgh, for a heavy hydraulic machine to make basic brick for lining the new open-hearth steel furnace. They also have orders for a 36×48 Porter-Hamilton engine for the Beaver Falls mills of Carnegie, Phipps & Co., and one from Shoenberger & Co., of Pittsburgh, for an 18×24 to run their nine-inch train.

The Iowa Construction Co., of Des Moines, has filed articles of incorporation in Iowa, with a capital stock of $500,000.

The Campbell & Zell Mfg. Co. has, it is stated, purchased the Baltimore Car Wheel Co.'s old foundry and machine shop. The foundry is 160 × 80 ft., and the machine shop, three stories, 60 × 60 ft. The company has a capital stock of $100,000. J. Vernon Campbell is president.

The Roanoke Engine & Machine Co. has been incorporated with L. H. Simmons, President; William Lunsford, Vice-President, and L. T. Powell, Secretary. The capital stock is to be $100,000. The company expects to have works in operation in six months.

The Consolidated Car Heating Co., of Albany N. Y., has absorbed the Automatic Car Heating Coupler Co., of Detroit, Mich., and has acquired the ownership of the "Peerless Coupler" and other appliances.

The Union Foundry & Machine Co., of Catasauqua, Pa., recently shipped to the Bridgeport Rolling Mill Co., at Bridgeport, Conn., an improved power shear weighing 65,000 lbs., with engine attached.

Westinghouse, Church, Kerr & Co., 156 Lake street, Chicago, report the following among other sales of the Roney Mechanical Stoker and Smokeless Furnace: Carnegie, Phipps & Co., Pa., 28 stokers; Washington & Georgetown Railroad, three stokers; Laclede Gas Light Co., St. Louis, six stokers; City of Chicago, electric light and power stations, 16 stokers; Missouri Electric Light & Power Co., St. Louis, Mo., 12 stokers; Thomson-Houston Electric Co., Omaha, Neb., four stokers; Sioux City Cable Railway Co., Sioux City, Ia., four stokers; New Castle Steel Co., New Castle, Pa., seven stokers.

The Industrial Works, of Bay City, Mich., is at present completing a steam shovel to fill a recent order from the Michigan Central, making the fifth machine of this class which this company has purchased of them. Orders have also recently been received from the Chicago, Burlington & Quincy for two 15-ton steel cranes with car; from the Cincinnati, New Orleans & Texas Pacific for two similar cranes and cars; from the Chicago & Atlantic, for a combination turn-table, and from a company on the Pacific Coast for an extension pile-driver, with car and machinery.

Iron and Steel.

A new furnace just completed by the Shelby Iron Works was put in blast at Shelby, Ala., last week.

Carnegie, Phipps & Co., Limited, of Pittsburgh, recently placed an order for 2,000 tons of Bessemer pig iron with the Talladega Iron Co., of Birmingham, Ala., to be used in the Homestead Steel Works, at Homestead, Pa. Several other Northern iron and steel companies have given orders for quantities of this pig iron to test it.

The North Carolina Steel & Iron Co., with a capital stock of $1,000,000, has been organized at Salisbury, N. C., to build a Bessemer iron furnace of 150 tons daily capacity, at Greensboro. The officers are: James A. Odell, President; J. J. Newman, Salisbury, N. C., Vice-President and General Manager; S. H. Wiley, Secretary and Treasurer.

The Greensburg Steel Co. has been organized in Pennsylvania, with a capital stock of $100,000, by Robert S. Jamison, A. C. Isaacs, J. Clark Williams, and others.

Jennings Bros. & Co., Limited, proprietors of the West Penn Steel Works, at Leechburgh, Pa., will remove a portion of the steel-making plant to Allegheny City, Pa. The firm will erect a 12-ton Siemens-Martin open-hearth furnace. The rolling mill will not be removed.

The Bristol Iron & Steel Co. has closed a contract to build a 150-ton plant furnace at Bristol, Tenn. The company includes Samuel Dickson, President of the Crane Iron Co.; Abraham S. Patterson, President of the Pulaski Iron Co., and others.

The Vanderbilt Steel & Iron Co. has let a contract for building its 100-ton iron furnace, at East Birmingham, Ala., to Stein & Schwarz, of Philadelphia, Pa.

The machine shop of the New Glasgow Steel & Forge Co.'s works has been destroyed by fire. The fire extended to the main building, which contains the heavy machinery, but was controlled in time to save the structure.

The Rail Market.

Steel Rails.—Several sales of moderate lots have been made by Eastern mills at $35, which is now quoted by all mills in the East. These sales aggregate about 10,000 tons, and are the only ones reported, except a resale of a lot of 3,500 tons at $34. Pittsburgh mills have sold a lot of about 10,000 tons to a Southern road at private terms. The Chicago mills have made no important sales. Quotations in the East are $35; at Pittsburgh, $35@ $36, and at Chicago, $37@ $37.50.

Old Rails.—In the East sales have been made at $26.75; at Pittsburgh a lot of 1,000 old iron rails was sold at $28, and at Chicago 700 tons were sold at $26.50. Old steel rails bring $22.50@ $23.50 at Pittsburgh, and $20.50@ $21 at Chicago.

Electric Transfer Table at Waukesha Shops.

The Sprague Electric Equipment Co., of Chicago, has put one of its motors on the transfer table at the Waukesha shops of the Wisconsin Central, using the overhead two-wire system.

The table was built to carry a load of 35 tons. The length of the pit is 261 ft., and the speed required is 150 ft. per minute. The motor and gearing are located in the middle of the table at the side of the track. All the machinery is sheltered. The motor is a Sprague 15-horse power machine of the type now used in street car work. Its maximum speed when under load is 800 revolutions per minute. The motor is geared to the main shaft of the table in the ratio of 16 to 1. Cut gears are used throughout, with the exception of the one on the motor, which is of rawhide. Copper-plated carbon brushes are used.

Current is supplied by a 320-light Edison dynamo, located about 250 feet from the pit. It is an ordinary Edison hand regulated machine, and is used for lighting the shops. Connection is made with the motor through two trolleys bearing against the two overhead trolley wires. The two wires are of No. 4 silicon bronze. There is a capstan for pulling cars on and off the table.

The Detroit River Bridge.

The Secretary of War has sent to the Senate the report of a board of army officers upon the practicability of and necessity for a bridge at Detroit. The board condemns a tunnel on account of cost and objections to operating it, reports against a suspension bridge of one span and a drawbridge, and recommends the plan of G. Lindenthal of a bridge 140 ft. above water, with one central span of 1,000 ft. clear opening and two side spans of 750 ft. each, as offering the minimum impediments possible in the present state of the art of bridge building to lake traffic.

Port Arthur Breakwater.

The first section of this important work, 2,000 ft., which was commenced in January, 1885, cost $181,000, and the second addition of 1,600 ft. was made in 1888, at a cost of $109,000, and the completing portion of 1,500 ft. was let this year, to cost $33,000. The whole work will be 5,490 ft. long, is 3,000 ft. from shore line, and shelters 450 acres of harbor. Since work began the structure has only cost some $165 for repairs. The cribs are 100 × 30 ft., and 3,500 soundings were taken for the work. The central opening is 350 ft. wide with 18 ft. at low water, and 17 ft. depth at the other two openings. Three steamships have passed through at the same time in the central opening. Some few years ago only vessels of 500 to 800 tons capacity came to the port, but now those of 3,000 are in regular service.

Steamship Speed at Half Power.

It has frequently been stated that a prominent advantage of twin screw steamers is their security against complete disablement in case one of the engines breaks down, added to the fact that with one engine the vessel can be propelled at about three-quarters of the usual speed. A good illustration of these statements has recently been furnished by the Inman steamer "City of New York," which broke one of the crank pins of the port engine on her last eastward trip, and finished the voyage with her starboard engine. A comparison of the daily runs under these circumstances with three daily runs of the preceding eastward trip gives the following results:

	Daily runs, nautical miles. with both engines.	with one engine.	Ratio.
1	474	375	.791
2	461	382	.829
3	417	352	.844
Total and averages.	1,109	1,352	.820

The above table further illustrates the enormous cost which the ocean racers must pay to produce their fine records, and the comparatively slight increase in speed obtained by doubling the propelling power.

Hudson River Tunnel.

It is stated that the work on the east end of the Hudson River tunnel between New York and Jersey City is now going on vigorously, and that the lining has been completed for about 2,000 ft. Samuel Pearson & Son, of London, England, have taken a contract on the work.

The Pintsch Lighting System.

The Safety Car Heating & Lighting Co., of New York, has arranged with the Central of New Jersey, to furnish the Pintsch gas-lighting system for cars of that road. Contracts have been let for the construction of gas works at Communipaw, N. J., which will be completed in three months. Works are being constructed at Boston to supply the cars of the Wagner Palace Car Co. and the Boston & Albany, Old Colony and New York & New England roads. At Chicago works have just been completed for furnishing gas to the cars of the Lake Shore & Michigan Southern, Chicago, Rock Island & Pacific, Cincinnati, Hamilton & Dayton, Louisville, New Albany & Chicago, Wabash and other roads. A large number of Pullman and Wagner cars are supplied from this point. The works at Mott Haven, N. Y., supply more than 100 cars daily, and the gas from these works is transported to the Grand Central station for supplying the short trains on the New York Central & Hudson River, and also the cars of the Boston & Albany, Shore Line, New York & New England, and others entering the Grand Central Station.

THE SCRAP HEAP.

A Sharp Curve.

An engineer working on the survey of a line which has recently been located through a somewhat mountainous country tells of a complication which involves engineering difficulties not often met with. It is familiar knowledge that the surveys of the Hoosac Tunnel from the east and the west end, respectively, were so accurately made that the lines of the two headings varied only about 1 in., but in this case the refinements of engineering art were not carried quite so far. One of the field engineers was a fellow who had been hanging around for a job some time, and his professional reputation was not of the very highest. The Chief Engineer therefore decided to send a trusted office assistant out on an inspecting tour. This man arrived on the ground about the time the line for the division in question had reached a point where it should connect with the line run by the next party to the east. The rest of the story can best be told by relating the conversation between this engineer (of the eastern division) and his chief:

C. E.—"My man tells me that you have not succeeded in making a very good connection with Mr. Blank; how

is it? I understand that your line and his come together at a right angle; is that so?"

Field Engineer (who had no fears of the correctness of his own part of the work)—"A right angle! Don't mention it. It will require two turntables to make the connection!"

Steam and Horse Railroads.

Some comparisons of receipts by these two classes of roads have recently been made in Germany, showing that the gross receipts each day of the Berlin street railroads was $12.96 per car, while for each passenger car on the Prussian steam roads the gross receipts was $19.26. Considering the number of seats offered in each class of car, it appears that a seat in a horse car yielded 48 cents per day of 18 hours, and each seat in a car on the steam lines gave but 13 cents per day of 24 hours.

Another Old Locomotive.

The Adirondack Railroad Co.'s pioneer locomotive, the Maj.-Gen. Hancock, is now utilized by the present owner, the Delaware & Hudson, at Saratoga Springs, as a steam generator to keep up the heat in detached passenger coaches, that are heated by the McElroy system of steam heating. The old locomotive has a history, for it is a relic of Sherman's "Marching Through Georgia." It was originally built for service on a Georgia railroad in the ante-bellum days, and was afterward drafted into the Confederate service, from which it was captured during Sherman's raid at the taking of Dalton. It was sent to Chattanooga and there sold at a government sale of confiscated property, and was purchased by the late Dr. T. C. Durant, and used by him in hauling supplies in Tennessee as a government contractor. After the war he brought it north, and when as President of the Adirondack Company he equipped its railroad, its whistle was the first to awaken the echoes of the upper Hudson at North Creek. It was used as a passenger locomotive here for about 20 years, and has been twice rebuilt, but still retains portions of the original form and machinery.—*Exchange.*

A Carload of Extinct Live Stock.

Or, to use a less paradoxical expression, a load of live stock of a species now said to be practically extinct, recently passed over a New Hampshire road. It was a carload of buffaloes for Austin Corbin's game forest on Croydon Mountain, near Newport, N. H. They came from "Buffalo Jones," who herds them at Winnipeg, Man., are worth $13,000, and were 12 days on the road. There were started at the same time for Mr. Corbin, via New York, two elks, a moose, deer and several antelopes.

Burning of the "Groton."

The transfer ferryboat "Groton," recently purchased from the New York, Providence & Boston, by the Baltimore & Ohio, was burned at sea on Saturday night while being towed to Baltimore. When off Chincoteague Light, on the Virginia shore, she caught fire. The crew escaped to the ferryboat "Thames River." The loss is $40,000, fully insured. The "Thames River" was uninjured.

Iowa Railroad Commissioners' Report.

The statistical portion of the Iowa report is almost valueless by reason of its incompleteness. The roads fail to respond to the demands of the board. "It is utterly impossible," say the Commissioners, "with the returns furnished, to give reliable information on many matters which are of interest to the people of the state." Previous reports of the board have contained a table of tonnage over the various bridges across the Mississippi and Missouri rivers, and the board has undertaken to give this valuable table in the current volume, but the reports of the Chicago, Burlington & Quincy, and of the Chicago, St. Paul, Minneapolis & Omaha, are both lacking in this respect. Commenting upon the excuse given by the Chicago, Burlington & Quincy for not furnishing the facts, the board says: "The reason assigned for not furnishing this information is that the extreme poverty of the company had compelled it to abolish the statistical department."

During the year 72 persons were killed and 512 injured on the railroads of the state. Of those killed 4 were passengers and 35 employés; of the injured 25 were passengers and 442 were employés.

The report calls attention to several points where conflicting theories are entertained on some questions of the law, and recommends legislation to remove all doubt as to any points on which the authority of the board has been disputed. The suggestions of 1879, that certain duties devolving upon the Secretary of State be transferred to the board, are renewed. The question of where a "switch" ends and "haul" begins, the board asks the Legislature to determine. More legislation is asked on what is an "adequate" farm crossing; also to authorize the Board to change the name of stations to the name of the town in which they are located, whether the station be in an incorporated town or not, the present law applying only to incorporated towns. The power of the board to establish new stations has been questioned; legislation on this point, as also on the question whether roads must construct new highway crossings where highways are relocated after a rail road is built; also that the law be so fixed that all railways must use union depots when built. A law is requested compelling two roads running from or into the same town to connect their tracks, thus allowing choice of roads by all shippers on whichever line located. The Commissioners think they should properly be clothed with authority to compel joint rates. A statement as to what shall be regarded as "for charitable purposes" is also requested at the hands of the Legislature.

A Knight of the Tamping Bar.

President J. C. Clarke, of the Mobile & Ohio, was recently presented by his locomotive engineers with a clock in the design of a locomotive, recently exhibited at the Paris Exposition. In response Colonel Clarke made a speech which was continually interrupted by applause. He said that he began his railroad career by ramming dirt under cross ties at 50 cents a day . . . He presented the Brotherhood with a picture of the first locomotive he ever ran, in 1843, which was used in hauling poles for the first experimental telegraph line.

Fastest Trains Six Years Ago.

An Indianapolis railroad officer has been comparing the time-tables of six years ago on several Indianapolis roads with those of the present day, and finds that the accommodation trains now make the run between terminal sabout as quickly as the express trains did six years ago. He says: Between Indianapolis and Cincinnati, four hours was considered fast time for the express trains; now one road is making it in three hours and another in two hours and fifty minutes. Six years ago eight hours and a half was considered fast time between Indianapolis and Chicago; now all the express trains over the three lines make it in six hours or less, one making the run in five hours and a half. To St. Louis nine hours was thought to be good speed, and eight hours fast; now there are on each line two trains each way which make the run in six hours or less. From Indianapolis to Louisville four hours was considered fast time; now one train makes it in two hours and fifty minutes and two others in three hours. For years from Indianapolis to New York in 29 hours was fast time; now two trains make the run in 24 hours, and in the spring it will be cut down to 22 hours. Ten years ago 42 hours from Indianapolis to Boston was called good time, 38 hours fast time; now the Southwestern Limited lands passengers in Boston that leave Indianapolis at 3 p. m., at 7:30 p. m. next evening, making the run in 28½ hours.

General Railroad News.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Belfast & Moosehead Lake, semi-annual, $1.60 per share on the common stock, and 3 per cent. on the preferred stock.

Boston & Lowell, 3½ per cent., payable Jan. 1.

Central of Georgia, semi-annual, 4 per cent., payable Dec. 19.

Cleveland, Cincinnati, Chicago & St. Louis, 1½ per cent. on the common stock, and quarterly 1¾ per cent. on the preferred stock, payable Jan. 2.

Delaware & Hudson Canal, 1½ per cent., payable Dec. 16.

New York and Harlem, 4 per cent., payable Jan. 2.

Portsmouth, Great Falls & Conway, $6 per share, payable Dec. 16.

Rensselaer & Saratoga, 4 per cent., payable Jan. 2.

Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Clearfield & Jefferson, special, Dec. 27.

Cleveland & Pittsburgh, annual, Cleveland, O., Jan. 1.

Colorado Midland, special, Colorado Springs, Colo., Dec. 31, to act upon a proposed lease of the Rio Grande Junction.

Columbus, Hocking Valley & Toledo, annual, Columbus, O., Jan. 14.

Concord & Montreal, annual, Concord, N. H., Dec. 18.

Denver & Rio Grande, special, Denver, Colo., Dec. 31, to act upon a proposed lease of the Rio Grande Junction.

Housatonic, annual, Bridgeport, Conn., Dec. 17.

Hudson Tunnel, annual, 2 Nassau street, New York City, Dec. 17.

Louisiana North & South, annual, Gibsland, La., Jan. 15.

New York, Ontario & Western, annual, 16 Exchange Place, New York City, Jan. 15.

Rome, Watertown & Ogdensburg, annual, 96 Broadway, New York City, Dec. 28.

Wheeling & Lake Erie, annual, Toledo, O., Dec. 19.

Railroad and Technical Conventions.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *American Society of Civil Engineers* will hold its next annual meeting at the rooms of the Society, 127 East Twenty-third street, New York City, Jan. 15, at 10 o'clock.

The *New England Railroad Club* meets at its rooms in the United States Hotel, Beach street, Boston, on the second Wednesday of each month, except June, July and August.

The *Western Railway Club* holds regular meetings on the third Tuesday in each month, except June, July and August, at its rooms in the Phenix Building, Jackson street, Chicago, at 2 p. m.

The *New York Railroad Club* meets at its rooms, 113 Liberty street, New York City, at 7:30 p. m., on the third Thursday in each month.

The *Central Railway Club* meets at the Tift House, Buffalo, the fourth Wednesday of January, March, May, August and October.

The *Northwest Railroad Club* meets on the first Saturday of each month in the St. Paul Union Station at 7:30 p. m.

The *American Society of Civil Engineers* holds its regular meeting on the first and third Wednesday in each month, at the House of the Society, 127 East Twenty-third street, New York.

The *Boston Society of Civil Engineers* holds its regular meetings at Boston, at 7:30 p. m., on the third Wednesday in each month. The next meeting will be held at the American House.

The *Western Society of Engineers* holds its regular meetings at its hall, No. 67 Washington street, Chicago, at 7:30 p. m., on the first Tuesday in each month.

The *Engineers' Club of St. Louis* holds regular meetings in St. Louis on the first and third Wednesdays in each month.

The *Engineers' Club of Philadelphia* holds regular meetings at the house of the Club, 1,122 Girard street, Philadelphia.

The *Engineers' Society of Western Pennsylvania* holds regular meetings on the third Tuesday in each month, at 7:30 p. m., at its rooms in the Penn Building, Pittsburgh, Pa.

The *Engineers' Club of Cincinnati* holds its regular meetings at 8 p. m. on the third Thursday of each month at the Club rooms, No. 24 West Fourth street, Cincinnati.

The *Civil Engineers' Club of Cleveland* holds regular meetings on the second Tuesday of each month, at 8:00 p. m., in the Case Library Building, Cleveland. Semi-monthly meetings are held on the Fourth Tuesday of the month.

The *Engineers' Club of Kansas City* meets at Kansas City, Mo., on the first Monday in each month.

The *Civil Engineers' Society of St. Paul* meets at St. Paul, Minn., on the first Monday in each month.

The *Montana Society of Civil Engineers* meets at Helena, Mont., at 7:30 p. m., on the third Saturday in each month.

The *Civil Engineers' Club of Kansas* holds regular meetings on the first Wednesday in each month at Wichita, Kan.

Western Railway Club.

The next meeting of the club will be held Tuesday, Dec. 17, at 2 p. m., at its room, Phenix Building (Jackson street, opposite Grand Pacific Hotel), Chicago. The subjects for discussion are:

"Joint Inspection," to be opened by Mr. P. H. Peck, of the Chicago & Western Indiana.

"Testing Laboratories, Chemical and Mechanical."

PERSONAL.

—Mr. A. J. Bandy has been appointed Assistant General Freight and Passenger Agent of the Ohio River Road.

—Mr. W. H. Griswold has been appointed Resident Engineer of the Macon & Birmingham, at Woodbury, Ga.

—Maj. John D. Rogers, Solicitor of the Chesapeake & Ohio, died Dec. 1 from injuries received in an accident last August.

—Mr. Hugh McMillan has resigned the presidency of the Williames Car Heating Co., and has been succeeded by Mr. John S. Clark, of Boston.

—Mr. T. A. Phillips has been appointed Assistant General Manager of the Florida Central & Peninsular Railroad, with headquarters at Jacksonville.

—Mr. Robert B. Owen, who has been General Agent of the Williames Car Heating Co. for some time, has severed his connection with that company.

—Mr. Henry W. Gays, Manager of the Wiggins Ferry Co., has been appointed General Superintendent of the St. Louis Merchants' Bridge & Terminal Co.

—Mr. J. C. Stubbs has been elected Fourth Vice-President of the Southern Pacific Co., with general charge of the traffic on all the lines included in the system.

—Mr. A. D. Dwelle, formerly Assistant General Passenger Agent of the Wabash, has resigned the position of Assistant General Passenger Agent of the Iowa Central.

—Mr. W. P. Kirtland, Superintendent, and Thomas H. Dobson, Engineer, of the Western Pennsylvania Division of the Pennsylvania have resigned, to take effect Jan. 1.

—Mr. W. W. Allen has resigned his position as Manager of the coal properties of the Atchison, Topeka and Santa Fe, and Mr. C. J. Devlin has been appointed his successor.

—Mr. John S. Kennedy, formerly Superintendent of the Pulaski Iron Co., at Pulaski City, Va., has been appointed Superintendent of the Everett Furnace, at Everett, Pa.

—Mr. L. D. Heusner, City Passenger Agent of the Michigan Central at Chicago, is the inventor of the new form of round-trip excursion ticket mentioned in the traffic columns last week.

—Mr. Patrick Ryan, for several years Master Mechanic of the Owensboro & Nashville at Russellville, has resigned to take a similar position on the Kentucky Union at Winchester.

—Mr. C. B. Jones has been appointed General Freight and Passenger Agent of the Georgia Midland & Gulf, to succeed Mr. C. W. Chears, who resigned to accept a position with the Central of Georgia.

—Chairman Cooley of the Inter-state Commerce Commission has returned to his duties at Washington, though his health is by no means restored, and he has left Ann Arbor against the advice of his friends.

—Mr. C. C. Wallard has been appointed Assistant Superintendent of Bridges and Buildings of the Southern Pacific, with headquarters at Algiers, La., to fill the vacancy caused by the resignation of Mr. W. A. Lutes.

—Mr. E. O. Man has been appointed Superintendent of the Western Division of the Missouri Pacific at Atchison, Kan., to succeed Mr. J. A. Edson, who has resigned to accept service with the St. Louis, Arkansas & Texas.

—Mr. James Brown, at one time a prominent railroad contractor and for 30 years Roadmaster on the New York Central & Hudson River road, died in Rochester recently, aged 83 years. Mr. Brown was retired in 1883 on full pay.

—Mr. Thomas M. King has been elected President of the Baltimore & Philadelphia, an operated line of the Baltimore & Ohio, to succeed Mr. J. B. Washington, who has been President of the company since its organization in 1883.

—Mr. E. P. Vining, Traffic Manager of the New York & New England, has resigned. Mr. Vining was formerly Commissioner of the Western Traffic Association, and was appointed Traffic Manager of the New York & New England in February, 1888.

—Mr. John A. Sargent, Commercial Agent of the St. Louis & San Francisco, at Kansas City, has resigned that position, to become Assistant General Freight Agent of the Kansas City, Fort Scott & Memphis, to succeed Mr. A. J. Vanandingham, resigned.

—Mr. James D. Carson has been appointed Superintendent of the Louisville Southern, to succeed Mr. W. H. Adams, who accepts another position with the Louisville, New Albany & Chicago. Mr. Carson was formerly General Manager of the Chicago & Western Indiana, but resigned in August, 1888.

—Mr. I. H. Burgoon, for three years Receiver and General Manager of the Bellaire, Zanesville & Cincinnati, has retired from that position, the road having been taken out of the control of the court. Mr. Burgoon has been succeeded as General Manager by Mr. W. R. Crumpton, who was General Manager before the receivership.

—Mr. William P. Shinn, who has been Vice-President of the New York & New England for the last three years, declined a re-election at the annual meeting of this week. Mr. Shinn is well-known to most of our readers as a Past President of the American Society of Civil Engineers. He has probably had as varied an experience in railroad service as any other man.

—Mr. Charles Howard, Superintendent of the Worcester division of the New York, Providence & Boston, has been elected General Manager of the New York & New England. Mr. Howard is 48 years old, and has been in railroad service since 1870. He has been Superintendent and General Manager of several Western roads, and was elected General Manager of the Worcester, Nashua & Rochester May 1, 1885. From there he went to the Providence & Worcester Feb. 1, 1887, with which road he has since remained.

—Mr. William H. Fenner has resigned his position as President of the Allen Paper Car Wheel Co. to accept a position with the Otis Iron & Steel Co., with office in New York City. As president of the Allen Paper Car Wheel Co., his duties were closely connected with the shop management of the Pullman Palace Car Co. Mr. Fenner's experience in locomotive and car building is well known, and few men have a more extended railroad

acquaintance or a large number of warm personal friends among railroad men.

—Mr. T. A. Walker, the contractor for the Manchester Ship Canal, the Buenos Ayres Harbor works and other undertakings, died at his residence, Mount Ballan, near Chepstow, England, last week, at the age of 62. His death is a serious event, apart from the loss to his family, and the engineering world of which he was a respected and eminent member. His firm at present employs upwards of 24,000 men. Mr. Walker was born at Breadon, in Staffordshire, in 1828. He spent seven years on the Grand Trunk, and afterward took contracts on his own account in Lower Canada. In 1863 he made railroad surveys in Russia and subsequently in Egypt. He was manager of the works for the three firms that undertook the construction of the London Metropolitan and District lines. His work on the Severn Tunnel is a monument of engineering heroism and skill. He next took the Barry Dock contract, and subsequently the Manchester Ship Canal and Buenos Ayres Harbor contracts. He did not get his heavy contracts by low bids or under the stress of competition, but by arrangements under which he charged a fair price and gave the value he stipulated for. This year, it is said, the firm has had offers of contracts to the amount of twenty millions sterling, among them being overtures from the French government for the completion of the Panama Canal.

ELECTIONS AND APPOINTMENTS.

American Midland.—The Receiver has issued an order making changes in the official force of the road. C. M. Haskell has been removed as General Manager, and the duties of that position will be assumed by the Receiver. The office of Superintendent has been abolished; the office of Superintendent of Motive Power has been abolished. James A. Phelps has been removed as Auditor, and Wilbur Rogers, of Tolodo, has been appointed to fill the vacancy. Charles T. Lewis, of Toledo, has been appointed General Counsel.

Baltimore & Philadelphia.—The annual meeting of the stockholders of the Baltimore & Philadelphia was held Dec. 10. The following directors were elected: William Cauley, Col. Henry A. Dupont, Wilmington; Thomas M. King, George De B. Keim, Theodore Frothingham and J. Vansant Smith, Philadelphia; J. B. Washington and J. V. Patton, Pittsburgh, Pa. Mr. Keim takes the place of the late Lewis C. Cassidy and Mr. King takes the place of William M. Clements. The Board elected the following officers: President, Thomas M. King; General Manager, J. T. Odell; Secretary, John C. Farra; Treasurer, W. J. Ijams; Auditor, W. T. Thelin.

Bellaire, Zanesville & Cincinnati.—This road has passed out of the control of the Receiver, and the following officers have been appointed: S. L. Mooney, President; M. Churchill, Vice-President; W. R. Crumpton, General Manager, Zanesville, O.; W. C. Mooney, Treasurer; W. F. Hunter, Counsel; J. K. Geddis, Chief Engineer; J. B. Rhodes, Superintendent of Transportation. The freight and passenger and purchasing departments will be in charge of the General Manager.

Belleville & St. Louis.—The incorporators and first board of directors of this Illinois company are: Julius Kohl, H. G. Webber, Joseph Fuss and Charles Krispel, of Belleville; Henry Selter and J. D. Baker, of Lebanon; J. L. Wiggins and Henry D. Sexton, of East St. Louis.

Bos'on & Albany.—The annual meeting of stockholders of the road was held in Boston, Dec. 11. The vote for the 13 directors were as follows: William Bliss, Boston; John Cummings, Woburn; E. L. Davis, Worcester; Chauncey M. Depew, New York; J. N. Dunham, Pittsford; Edward B. Gillett, Westfield; E. D. Hayden, Woburn; Samuel Hoar, Concord; Moses Kimball, Brookline; Jacob C. Rogers, Peabody; James A. Rumrill, Springfield; C. S. Sargent, Brookline; John P. Spaulding, Boston, all receiving 18,252 votes, the whole number cast.

Boston & Maine.—The annual meeting of the stockholders of this road was held at Lawrence, Mass., Dec. 11. It was voted to increase the Board of Directors from eight members to eleven. The directors chosen were: George C. Laird, Newtown; Amos Paul, South Newmarket, N. H.; W. S. Stevens, Dover, N. H.; Joseph S. Recker, Deering, Me.; Richard Olhey, Boston; Samuel C. Lawrence, Medford; Frank Jones, Portsmouth, N. H.; Wm. T. Hart, Boston; Alvah Sulloway, Franklin, N. H.; Asah P. Potter, Boston, and James T. Furber, Somersworth, N. H. The last three are new directors.

Buffalo & Southwestern.—W. S. Bissell, James Adams, E. G. Spaulding, J. M. Richmond, W. H. H. Newman, Daniel E. Bailey, E. R. Spaulding, Thomas Hodgson, Daniel O'Day, Henry M. Watson, Samuel H. Spaulding, Richmond Kinzman, and William H. Barnes have been elected Directors of this road.

Central New England & Western.—Mr. John Hawthorne has been appointed Master Mechanic of the shops at Hartford, Conn.

Chesapeake & Ohio.—L. B. Jackson has been appointed Superintendent of Construction of the road, with headquarters in Cincinnati.

Chicago & Eastern Illinois.—H. E. Felton has been appointed Assistant General Freight Agent of the road, with headquarters at Chicago.

Chicago & Northwestern.—R. A. Cowan has been appointed Superintendent of the Madison division of the road, vice G. F. Bidwell, resigned to accept service with the Milwaukee, Lake Shore & Western.

Chicago & Southeastern—The incorporators and first board of directors are Adams A. Goodrich, of Jerseyville; E. E. Prussing, of Highland Park, and James C. Hutchins and Frank H. Brown, of Chicago.

Cincinnati, Jackson & Mackinaw.—T. C. M. Schindler has been appointed General Freight and Passenger Agent of the road, in place of H. R. Johnston, deceased. The office of Assistant General Freight and Passenger Agent has been abolished.

Denison & Washita Valley.—The following are the officers of this company: W. B. Munson, President; Colgate Hoyt, Vice-President and Treasurer; Edward Perry, Superintendent; C. W. Wetmore, Secretary, and J. A. Seaver, Assistant Secretary. The principal office is at Denison, Tex.

Denver, Colorado Canon & Pacific.—The officers of this road now are: H. B. Chamberlin, President; John Hurlburt, Vice-President; E. A. Reynolds, Secretary; John L. McNeal, Treasurer, and Robert B. Stanton, Chief Engineer.

East Chicago & Lake Michigan.—The incorporators of this company are Thomas W. Johnstone, Joseph W. Taylor, David Scott, James O'Neill and L. M. Jones.

Eastern.—The annual meeting of the stockholders was held Dec. 11. The old board of directors was re-elected, with the exception of William Haskell, Leopold Morse, and Charles Sinclair, who take the places of N. J. Bradlee, Frank Jones and S. Endicott Peabody.

Duluth, Red Wing & Southern.—H. B. Briggs has been appointed Division Superintendent of the road, with office at Red Wing, Minn., to succeed J. H. Lackey, resigned.

Fort Worth & Denver City.—The annual meeting of the stockholders of the road was held in Fort Worth, Tex., Dec. 10. The stockholders elected the old directors, except that Daniel Carry, of Fort Worth, was elected in place of E. W. Taylor, and Gen. G. M. Dodge in place of J. Meyer, of New York. The directors elected the following officers: President, Morgan Jones; First Vice-President, Gen. G. M. Dodge; Second Vice-President, Channing F. Meek; Secretary and Auditor, B. H. Calef; Treasurer, J. G. Jones.

Franklin & Megantic.—The board of directors elected at the last annual meeting are as follows: V. B. Mead, N. B. Bryant, S. W. Sargent, Boston; Philip H. Stubbs, Strong; W. D. Heath, Salem; Orrin Tufts, John Winter, Kingfield. The directors elected V. B. Mead President; Phillip H. Stubbs, Clerk and Treasurer; F. S. Mead, Superintendent.

Gulf, Colorado & Santa Fe.—At a special recent meeting of the board of directors of the company the following directors and officers were elected: George C. Magoun, Director, vice Isaac T. Burr, resigned; Allen Manvel, Director and President, vice William B. Strong, resigned; Joseph W. Reinhart, Fourth Vice-President and George C. Magoun, Chairman of the Board of Directors.

Gull Lake & Northern.—The following are the officers of this company, recently chartered in Minnesota. George A. Pillsbury, Minneapolis, President; Charles A. Pillsbury, Vice-President; W. W. Huntington, Secretary, and W. B. Ransom, Treasurer. John S. Pillsbury, George P. Wilson and A. E. Bardwell are the incorporators.

Lehigh & Hudson River.—At the annual meeting of the stockholders of the company last week the following were chosen directors: Grinnell Burt, G. W. Sanford, Warwick, N. Y.; Austin Corbin, John S. Martin, G. R. Sheldon, Edward D. Adams, J. R. Maxwell, George F. Baker, New York; Joseph H. Harris, Francis C. Yarnall, Edward W. Clark, Edward Lewis, Philadelphia; G. A. Hobart, Paterson, N. J. Grinnell Burt was re-elected President of the company for the thirty-first time, with D. B. Halstead, of New York, Secretary, and John Sayer, of Warwick, Treasurer.

Louisville, Hardinsburg & Western.—The stockholders have elected the following board of directors: L. Green, W. J. Dean, Jr., C. P. Bush, R. M. Jolly, J. K. McCracken, George H. Lampkin, J. P. Helm. The directors elected the following officers: L. Green, President; W. J. Dean, Jr., Vice-President; C. P. Bush, Secretary and Treasurer.

Louisville Southern.—James D. Carson has been appointed Superintendent of the road at Louisville, Ky.

Mandarin.—The following are the directors of this Florida company: Joel D. Mead, Mandarin; W. L. Crawford, St. Augustine; C. Hodgson, San Jose, and J. S. Fairhead, J. S. Smith, Jr., and J. R. Parrott, Jacksonville.

Mobile & Dauphin Island.—The officers of the company are: Robert Sewell, President, 34 Nassau street, New York City; H. Austill, Agent, Mobile, Ala.; Sir George Bruce, Consulting Engineer, London, England; T. K. G. Wright, Resident Engineer, Venetia, Ala. The general office of the company is at 34 Nassau street, New York City.

Mobile & Montgomery.—At the annual meeting of the stockholders of the road, held recently at Montgomery, the following officers were elected: President, G. W. Craig, Montgomery; Vice-President, A. C. Danner, Mobile; Secretary, J. H. Ellis, Louisville. Messrs. J. B. Thompson and J. I. McKinney were elected to fill vacancies in the board, vice Josiah Morris and B. C. Epperson.

Newark & Passaic.—The incorporators are: John Hood, of Camden, N. J.; David G. Baird, of Beverly; Sidney Ward, of Brooklyn; Charles L. Corbin, of Metuchen; Frank R. Baldwin, of Jersey City; Abram L. Voorhis, of Newark, and Frank W. Coward, of Perth Amboy.

New York & New England.—The following directors were elected at the annual meeting, in Boston, Dec. 10: J. A. Bostwick, Thomas Rutter, John A. Macaulay, Sidney Dillon, Henry Hentz, A. E. Orr and E. V. Cary, of New York; W. A. Haskell, Charles A. Sinclair, E. C. Fitz, E. V. R. Thayer, Jonas H. French and Charles A. Prince, Boston; Nicholas Sheldon and B. F. Vaughan, Providence; James L. Howard, Hartford; D. S. Plume, Waterbury; George M. Landers, New Britain; A. Sewell, of Portland. The new members are W. A. Haskell and C. A. Sinclair, who take the places of R. E. Robbins and William P. Shinn. The number of shares voted was 152,067. The directors organized by the election of the following officers: President, J. A. Bostwick, New York; Vice-President, William A. Haskell, Boston; Secretary, J. W. Perkins; General Manager, Charles Howard.

New York, Providence & Boston.—The following directors were elected at the annual meeting in Providence, Dec. 11. S. D. Babcock and George N. Miller, of New York; Nathan F. Dixon, of Westerly; Henry C. Robinson, of Hartford; George P. Wetmore, of Newport; Robert Knight, B. N. Lapham, of Providence; J. W. Wood, of South Orange, N. J.; J. Pierpont Morgan, John L. Riker, and George G. Hanen, of New York. The directors elected officers as follows: President, S. D. Babcock; Vice-President, G. M. Miller, Secretary and Treasurer, A. K. Longley.

Northeastern (South Carolina).—At the recent annual meeting in Charleston the following directors were elected: President, A. F. Ravenel; Directors, W. J. Walters, H. B. Plant, J. B. Palmer, C. O. Wite, B. F. Newcomer, and H. Walters. B. S. Rhett was elected Treasurer, and T. G. Main, Secretary.

Ohio, Indiana & Western.—D. J. Peffers has been appointed Purchasing Agent at Indianapolis, Ind., to succeed Hunter Gunnell, resigned. W. W. Lynn has been appointed Auditor, vice C. B. Lockwood, resigned

Parkersburg Branch.—The following officers and directors have been elected: Orland Smith, President; J. W. Kine, Treasurer, and W. W. Van Winkle, Secretary. Directors, W. P. Burns, Decatur H. Miller, Robert H. Garrett, W. H. Blackford, J. N. Camden, W. N. Chancellor, Charles H. Shattuck, W. W. Taylor, D. C. Winebrewer and Thomas S. Spates.

Pennsylvania.—At a meeting of the Board of Directors of the company, held this week, William H. Barnes, of Philadelphia, was elected a director, to fill the vacancy caused by the death of William Thaw, of Pittsburgh.

Pennsylvania & West Virginia.—W. Bugbee Smith, President; L. U. Maltby, Joshua D. Baker, George Martin Brill, Tattnall Paulding and A. T. James, Philadelphia; James C. Holden, Madison, N. J.; Homer S. Beardsley, New York City, and Wm. P. Robeson, Brooklyn, and Andrew J. Perry, Brooklyn, N. Y., are the incorporators of this new company.

Pensacola & Atlantic.—The annual meeting of the stockholders of the road was held at Pensacola last week. Milton H. Smith, A. M. Quarrier, W. F. McCormick, Cushman Quarrier, of Louisville, Ky., and W. A. Blount, of Pensacola, were elected directors. M H. Smith was elected President, W. D. Chipley, Vice-President, J. D. Ellis, Secretary, and William W. Thompson, Treasurer.

Pittsburgh, Columbus & Fort Smith.—The directors of the company have elected the following officers: W. H. Cogshall, President, and D. C. Finn, Vice-President; O. J. Nichols, Secretary; E. C. Scammon, Treasurer, and Samuel H. Smith, Attorney. The chief office is in Pittsburgh, Kan.

Pittsburgh & Connellsville.—The following directors were elected at the recent meeting: Orland Smith, Cincinnatti; Robert Garrett, Mendes Cohen, Charles Webb, Findley H. Burns, Baltimore, Md.; John D. Scully, C. L. Fitzhugh, George A. Berry, William Metcalf, William J. Moorhead, Pittsburgh, Pa.; W. H. Koontz, Somerset, Pa. The directors elected Orlando Smith President and J. B. Washington Secretary and Treasurer.

Portland & Rochester.—The annual report of the road was held recently, and Directors were elected as follows: G. P. Wescott, Nathan Webb, W. L. Putnam, Charles McCarthy, Jr., J. P. Baxter, G. C. Lord, S. J. Young, J. S. Ricker and Arthur Sewall. W. H. Conant was elected Treasurer, J. W. Peters Superintendent, and G. P. Wescott, President.

Providence, Warren & Bristol.—At the annual meeting last week the following directors were elected: Charles F. Choate, Southboro; Frederick L. Ames, Easton; W. Goddard, Providence; Royal C. Taft, Providence; Nathaniel Thayer, Lancaster; J. R. Kendrick, General Manager: I. N. Marshall, Superintendent, and J. M. Washburn, Treasurer.

Richmond & West Point Terminal—The following board of directors was elected at the annual meeting in Richmond Dec. 10: John H. Inman, president; S. M. Logan, James B. Pace, John A. Rutherford, George J. Gould, Simon Wormser, John G. Moore, Edward Lauterbach, George S. Scott, Samuel Thomas, Calvin S. Brice, John H. Hall, James Swan, Charles M. McGee, John C. Calhoun, W. S. Chisholm, Patrick Calhoun, George Hoadley, and Edgar M. Johnson.

Rumford Falls & Buckfield.—At the recent annual meeting the stockholders elected the following directors: William L. Putnam, Portland, President; Charles R. Milliken, Portland; William H. Moulton, Portland; George C. Wing, Auburn; Otis Hayford, Canton; George D. Bisbee, Buckfield; R. C. Bradford, Portland, Clerk.

St. Louis & Central Illinois.—The incorporators and first board of directors of this Illinois company are: Frank C. Hollins and John E. Risley, of New York; Tracey E. Roberts, of Brooklyn; H. W. Dana, of Lincoln, Ill.; H. R. Phinney, of Alton, Ill.; J. M. Stark, of Pawnee, Ill.; and Robert McWilliams, of Litchfield, Ill.

Sea View.—The stockholders elected the following directors at the recent annual meeting: I. M. Bon, Joseph Fahys, Felix Campbell, Jesse Johnson, A. R. Johnson, James Jourdan, E. L. Langford, H. C. Mangles, J. L. Morrow, F. A. Schroeder, Alonzo Slote, D. H Valentine, H. Von Deilen. The directors elected the following officers: F. A. Schroeder, President; I. M. Bon, Treasurer, and J. L. Morrow, Superintendent and Secretary.

Sioux City & Northeastern.—The following directors were elected at a meeting in Sioux City last week: John Pierce, E. H. Stone, W. L. Joy, N. Desparois, F. W. Little, H. A. Johns, F. S. Butler, C. Wise, W. P. Manley. The directors elected the following officers: President, John Pierce; Vice-President, W. L. Joy; Secretary, F. S. Butler; Treasurer, H. A. Johns.

South Carolina.—In the United States Circuit Court at Columbia, S. C., D. H. Chamberlain, has been made permanent Receiver of this road.

South & North Alabama.—The following directors were elected at the recent stockholders' meeting: H. F. DeBardeleben, M. H. Smith, John T. Milner, Bolling Hall, Josiah Morris, F. M. Bill, L. Chambers, A. M. Quarrier. The directors re-elected the following officers: H. F. DeBardeleben, President; M. H. Smith, Vice-President; G. W. Craik, Secretary.

Temiscouata.—At a meeting of the shareholders the following directors were elected: J. J. McDonald, Hector Cameron, of Toronto; Hon. George Irvine, Dr. Granbois, M. P., J. Israel Tarte and R. Ryan. J. J. McDonald was elected President, Hector Cameron, Vice-President and Thomas Crockett, General Superintendent.

Texas Trunk.—J. D. Tramwell, Engineer, has also been appointed Superintendent at Dallas, Tex., to succeed J. J. Kertin, resigned.

Trenton Cut-Off.—J. N. Du Barry, John P. Green, Amos R. Little, Wistar Morris, Wm. A. Patton, N. P. Shortridge and Henry D. Welsh, all of Philadelphia, are the incorporators of this Pennsylvania company.

York Harbor & Beach.—The annual meeting of the road was held in York, Me., Dec. 4, and the old board of directors was re-elected.

OLD AND NEW ROADS.

Atchison, Topeka & Santa Fe.—A mortgage for $150,000,000, payable in 100 years at five per cent. interest, was filed in Kansas last week by the Union Trust Co., of New York, on the road. The plan of reorganization was also filed with the mortgage.

The gross earnings, operating expenses (exclusive of

taxes), and net earnings of the road and its auxiliary lines for the month of September, 1889, were as follows:

	Gross earn.	Oper. expen.	Net earn.	Oper. mileage.
Atchison, Topeka & Santa Fe and leased lines, including Chicago Line, St. Joseph road, Chicago, Kansas & Western, New Mexico & Arizona and Sonora lines	$2,171,503	$1,209,596	$961,907	4,934
St. Louis, Kan. City & Colorado	6,971	5,322	1,649	61
Gulf, Colorado & Santa Fe	583,904	309,956	273,948	1,058
California Central	84,122	65,091	19,030	266
California Southern	61,070	49,523	11,546	211
Total	$2,907,568	$1,639,488	$1,268,080	.....
Roads jointly owned with other companies:				
Atchison Co.'s one-half	133,190	101,756	31,434	.....
Grand total	$3,040,758	$1,741,244	$1,299,514	.....

The comparative statement of all lines is as follows:

	Gross earn.	Net earn.	Per mile. Gross earn.	Per mile. Net earn.	Mileage.
October, 1889	$3,040,758	$1,299,514	$428	$183	7,112
October, 1888	2,843,651	892,615	400	126	7,114
Inc. Oct., 1886	$197,107	$406,899	$28	$57	Dec. 2

Baltimore & Eastern Shore.—The section between Easton, on the Philadelphia, Wilmington & Baltimore and St. Michaels, Md., was opened for traffic this week. The section between St. Michaels and Eastern Bay will be finished shortly, probably by Jan. 1. A force of graders is now working on this section, and also east of Easton, at the Choptank River and between the Nanticoke River and Salisbury, Md. An injunction has been served upon the County Commissioners of Talbot County to restrain them from indorsing $50,000 of the bonds of the company, which they were authorized to do by vote in 1887.

Baltimore & Ohio.—The Confluence & Oakland having been completed and turned over to the Baltimore & Ohio for operation, notice has been given that the road will be operated by that company in connection with the Pittsburgh Division. The point of connection with the Pittsburgh Division is at Confluence & Oakland Junction, 66 miles from Cumberland and 84 miles from Pittsburgh, from which point the road extends to Manor Lands Station, Garrett County, Md. The stations and distances are as follows: Charlestown, 1 mile; Tub Run, 8; Somerfield, 9; Reason Run, Pa., 11; Buffalo Run, Md , 14; Selbysport, 15; Friendsville, 17; and Manor Lands, 20 miles.

Bellefonte & Buffalo Run.—This road is now running regular trains from Bellefonte, Pa., where it connects with the Pennsylvania, westward, to State College, 18 miles. Thomas A. Schoonmaker, of Bellefonte, is Superintendent.

Birmingham Mineral.—The Red Gap Branch from Gate City to Graces, Ala., 10 miles, upon which tracklaying was recently commenced, will be completed by Dec. 20. The branch from Helena to Gurnee, 10 miles, will be finished by March 1. This branch is to be continued to Blocton, on the Briarfield, Blocton & Birmingham. A branch five miles long from Milldale to the mines of the Standard Coal Co., has just been put under contract. This gives 25 miles of branches now under construction. The maximum grades are 66 ft., and the maximum curves eight degrees. There are four iron bridges. J. W. Worthington & Co., of Birmingham, have the contracts on all the branches.

Boston & Albany.—At the annual meeting of the stockholders of the road, held in Boston this week, it was voted to accept the act of the General Court of Massachusetts to increase the capital stock of the corporation by $10,000,000.

Boston & Maine.—At the annual meeting in Lawrence, Mass., Dec. 11, the directors were authorized, by a unanimous vote, to issue stock, common or preferred, to an amount not exceeding $3,500,000; the proceeds to be used to retire, by exchange, purchase, or otherwise, the company's outstanding bonds. At the special meeting the lease of the Northern Railroad was approved by a vote of 42,095 to 142.

Central Ontario.—This company is applying for a subsidy of $6,400 per mile to extend its line to Sudbury, Ont. The company proposes to erect blast furnaces at the Sudbury Mines if the subsidy is voted.

Chicago, Burlington & Quincy.—The following statement shows the earnings and expenses of the system for the month of October and the ten months ending Oct. 31, 1889, compared with the corresponding periods in the year 1888:

Month of October:	1889.	1888.	Inc. or Dec.
Gross earnings	$2,845,673	$2,802,342	I. $43,330
Oper. expen	1,413,970	1,534,060	D. 120,089
Net earnings	$1,431,702	$1,268,282	I. $163,420
Ten months to Oct. 31.			
Gross earnings	$21,972,630	$19,390,655	I. $2,581,975
Oper. expen	13,523,570	14,805,297	D. 1,281,727
Net earnings	$8,449,060	$4,585,357	I. $3,863,703

Chicago, Kansas & Nebraska.—A meeting of the stockholders of the company was held in Topeka, Dec. 4, at which the contract with the Kansas City, Wyandotte & Northwestern was ratified. By this contract the latter road is granted the use of the track of the Chicago, Kansas & Nebraska between Virginia and Beatrice, Neb., about 12 miles, together with the joint use of the terminal facilities of the company at Beatrice.

Chicago & Southeastern.—The company has filed articles of incorporation in Illinois to construct a line from Chicago to a point on the Indiana State line in the township of Thornton, Cook County. The principal business office is to be at Chicago, and the capital stock is $1,000,000.

Chippewa Valley.—Interest has been recently revived in this road, which is a proposed line from Mount Pleasant through Big Rapids and Luther to Manistee. It is stated that work will begin near Big Rapids in a few weeks. D. M. Monjo is President.

Columbus, Lima & Milwaukee.—The 43 miles of this road between Defiance and Lima, O., has been nearly all graded and tracklaying may commence at once. Only a small force is now working on the road, and grading on the other sections of the road will not commence till spring.

Covington & Macon.—Grading was commenced this week on a branch from Mahen, Ga., southeast, to Eatonton, about 18 miles.

Deloraine & Turtle Mountain.—The Dominion Government has granted this company a land subsidy of 6,400 acres per mile on the road from the coal mines, 17 miles from Deloraine, Man., through that town and northwesterly to Brandon. Work is now in progress sinking shafts at the mines, and grading on the road will probably be commenced in the spring.

Denison & Washita Valley.—Garvey Bros., have, it is reported, been awarded a contract to build 50 miles of this road, from near McAlister to a connection with the St. Louis & San Francisco at Cavanal Sta., I. T. Garvey Bros. have an office at McAlister, I. T., and will let subcontracts for grading and masonry at once. Edward Perry, Denison, Tex., is Superintendent.

Denver & Rio Grande.—A. D. Streeter, of Denver, has been awarded the contract for building the tunnel in Tennessee Pass, about seven miles feom Leadville, Col., near Mitchell. The tunnel will be about 2,500 ft. long, and probably 200 men will be put on the work at once.

Des Moines & Northern.—The recent organization of this company to succeed the St. Louis, Des Moines & Northern, and the plans for improving the line which are under consideration, has revived a project agitated some years ago to extend the line north from Boone to the Minnesota state line.

Dexter & Piscataquis.—The first train on this road was run between Dexter and Foxcraft, Me., 17 miles, last week. Regular trains will be put on in a few days. The line will be operated by the Maine Central.

Drummond County.—This road was formally opened last week between Drummond and Nicolet, P. Q., about 34 miles. The road will be continued to St. Hyacinthe next Spring, where it will connect with the line of the United Counties, which is under construction between Iberville and Sorel.

East Chicago & Lake Michigan.—This road, referred to last week, is to be about seven miles long, and extend from a point on the Calumet River, at East Chicago, to the line dividing the states of Indiana and Illinois. The capital stock is $150,000, of which $50,000 has been subscribed.

Easton & Northern.—The survey of this road has been made between Ashland and Easton, Pa., 10 miles, and the company is now having a survey made at Easton for a proposed tunnel, to reach the tracks of the Lehigh Valley. A bridge will also probably be necessary and it is understood that the Lehigh Valley has agreed to bear the cost of erecting it. The company is to ask the town of Easton to take $50,000 in stock, the funds to be used in building the tunnel.

Elgin, Joliet & Eastern.—The extension of the road from Spalding, Ill., north, is open for traffic to Rondout, connecting with the Chicago & Northwestern at Barrington, with the Wisconsin Central at Leighton, and with the Milwaukee Division of the Chicago, Milwaukee & St. Paul at Rondout. Within the next few weeks the line will be completed from Rondout to Waukegan, on Lake Michigan, connecting there with the Milwaukee Division of the Chicago & Northwestern. This will complete the connections of this belt line with the roads entering Chicago.

Franklin & Tilton.—The final location of the route from Franklin to Tilton, N. H., a distance of four miles, will be soon decided upon, and contracts will be let and ground broken as soon afterward as possible. This branch will be built and controlled by the Concord & Montreal and Boston & Maine companies.

Georgia, Carolina & Northern.—The grading between Chester and Clinton, S. C., is practically completed and tracklaying will soon commence. The survey on the 50 miles between Clinton and the Savannah River has been made, and the engineers are now surveying toward Athens, Ga. Construction on the section west of Clinton, through Greenwood and Abbeville, will begin in a few days.

Gull Lake & Northern.—This company has filed a charter in Minnesota to build a road from Gull Lake, in Cass County, to the northern boundary of the state. The capital stock is placed at $500,000. John S. Pillsbury, of Minneapolis, is President.

Houston & Texas Central.—John O'Keefe, of Dallas, Tex., has been awarded the contract for grading on the extension from Hutchins to Lancaster, Tex.

Huron & Ontario.—This company is applying for a charter for a road from the town of Goderich, Huron County, on Lake Huron, to a point at or near Hamilton, Ont. The road will probably pass through Blyth, Brussels, Listowel, Wellesley, Berlin, Preston, Galt and Dundas, to Hamilton.

Kanawha & Ohio.—A decree of sale has been entered in the United States Court at Cincinnati in the foreclosure suit of the Mercantile Trust Co., of New York, against this company.

Kansas City, Louisiana & Gulf.—Ground was broken at Arcadia, La., by C. D. Leeper, who has the contract for grading six miles of the road south from Arcadia. The locating survey has been finished but a short distance beyond the end of this contract. D. C. O'Keefe is manager of the construction company. J. H. Dawson is Engineer.

Keeseville, Ausable Chasm & Lake Champlain.—The grading has been completed on this road from Port Kent to Keeseville, N. Y., six miles, and the tracklaying has also been finished, except on a short piece of road near Ausable River, where a bridge is being erected over the Chasm. E. K. Barber, of Keeseville, N. Y., is President.

Knoxville & Augusta.—This road, which extends from Knoxville to Maryville, Tenn., 16 miles, has passed into the control of the East Tennessee, Virginia & Georgia.

Lehigh Valley.—Work is to commence in a few days on the extension from Roselle, N. J., to Newark, for which John Shields, of Flemington, N. J., has the contract. The contractor's machinery has been forwarded to Roselle, and laborers are arriving daily.

Louisville, Hardinsburg & Western.—The company has filed suit against W. V. McCracken & Co., the contractors, to have declared void $780,000 of stock issued to them on contract. It is alleged that McCracken & Co. are violating an agreement to build the road within half a mile of the Hardinsburg Court House.

Mandarin.—This company has been organized in Florida to build a road from a point on the Jacksonville, St. Augustine & Halifax River road, near South Jacksonville, in Duval County, Fla., to Mandarin, in Duval County, a distance of about 11 miles. The capital stock is $100,000. Joel D. Mead, of Mandarin, is a director.

Mexican Pacific.—Charles Thornton has secured a contract to build the road from La Puerto, on the Pacific Coast, to Frontiera, a distance of about 350 miles.

Michigan Central.—The double track between Maidstone Cross and Essex Centre, Ont., 4½ miles has been finished, and the work will be continued from Yarmouth east to Springfield, 10 miles and from the St. Claire Junction west to Iona, 10 miles, making 24½ miles in all, to be double tracked this fall.

Middlesborough Belt Line.—Allison Shafer & Co., of St. Louis, who were awarded, some time ago, the contract for constructing a section of this road, have been awarded the entire 12 miles. The road is to encircle the valley of Yellow Creek at Middlesborough, Ky., near Cumberland Gap. M. F. Neher is Chief Engineer.

Missouri Pacific.—Press dispatches state that the company has put under contract a new line, to extend from McGehee through Dermott, Ark., to the state line between Arkansas and Louisiana, 48 miles, and thence to McGoun, 18 miles, where a junction will be made with the Kansas City, Arkansas & New Orleans, running south through Monroe, La., to a point 28 miles south of that place. The line will be built to Alexandria, to a junction with the Texas & Pacific, giving the Missouri Pacific a new line between St. Louis & New Orleans on the west side of the river.

Napanee, Tamworth & Quebec.—Trains are now being run between Tweed and Kingston, Ont. The tracks of the Kingston & Pembroke are used between Harrowsmith and Kingston.

New Orleans & Northwestern.—The town of Hamburg, Ark., has voted this road $50,000 to extend its line to that place from Monroe. The road will be completed this month from Vidalia, La., west to Sicily Island. The company has under consideration two routes for its southern extension from Natchez toward New Orleans. One route follows the Mississippi River and passes through Wilkinson County; the other is more easterly through Franklin and Amite counties. It may yet be decided, however, to make Mississippi City or Mobile the southern terminus instead of New Orleans.

New Roads.—John N. Simpson, of Dallas, Tex., is interested in a project to build a road from Dallas to a coalfield in Parker County.

A survey is to be made by Brookhaven, Miss., for a proposed road from Brookhaven east through Lincoln and Lawrence counties to a point on the Pearl River, a distance of about 20 miles.

New York & Atlantic Highlands.—The road was sold at Sheriff's sale at Red Bank, N. J., Dec. 10. It was built a few years ago by residents of the communities through which it passes. The stockholders bonded the road in the sum of $20,000, and these bonds were purchased some time ago by the Central of New Jersey. At the sale this week the road was bid in by that company for $2,500. The line will hereafter be a branch of the road.

New York, Lake Erie & Western.—Another survey has been made for the proposed extension between Honesdale and Carbondale, Pa. The line, if built, would greatly shorten the haul on coal from the mines about Forest City and Carbondale, east, but it will be a very costly piece of road to build. Probably two or more tunnels, and at least one, will be necessary.

New York, Ontario & Western.—Work on the tunnel near Walton, N. Y., is in steady progress, and all but about 300 ft. of the earth work has been completed. Sixty men are now at work, and a steam shovel and locomotive are also employed. The rock work will probably be reached in a few days. The tunnel will be 1,600 ft. long. Ward & Leary, of Newburg, N. Y., are the contractors.

Niobrara & Sioux Reservation.—Preparations are being made to begin construction on this road, which is to be built from Niobrara, south 12 miles to Verdigre, Neb., on the Fremont, Elkhorn & Missouri Valley. Bonds to aid in the construction of the line were recently voted by the town of Niobrara. A survey has been made for a proposed short extension from Niobrara, across the Niobrara River, where it joins the Missouri River to the Ponca River.

Norfolk & Western.—The company is recording a mortgage of $20,000,000 on the road and its Elkhorn extension to provide funds to complete the line from Elkhorn Valley, McDowell County, W. Va., to Ironton, O. The road has been permanently located, and most of the rights of way secured down Tug River and the mouth of Pike Creek, up Pigeon to Laurel, and then down Twelve Pole to the Ohio River, near the Big Sandy River. This mortgage is included in the general consolidated mortgage for $45,000,000 recently authorized.

This company contemplates the construction, at an early date, of a branch line up Big Creek, to the mouth of Gooden Branch, a distance of four miles from Richlands, at which point the branch line leaves the Clinch Valley Division, and which is about 42 miles west of Bluefield, Va. The branch will reach coal deposits owned by the Clinch Valley Coal & Iron Co.

Northern (New Hampshire).—At a special meeting of the stockholders of the road, at Concord, N. H., last week it was voted to lease the road, with its branches and leased lines, to the Boston & Lowell for 99 years from Jan. 1 next at an annual rental of five per cent. for the first 7½ years and six per cent. for the remainder of the term, to be paid quarterly. The stockholders also agree to the assignment of this lease by the Boston & Lowell to the Boston & Maine road. The whole number of votes cast was 9,212, of which 8,600 were in favor of the lease.

Oregon Railway & Navigation Co.—The new track laid by this company since Jan. 1 aggregates 138 miles, as follows: On the Pleasant Valley Branch of the Oregon Railway Extension Co., from Palouse River to Oakesdale, 37 miles, completing this branch from Winona Junction to Seltice Junction, all in Whitman County Wash. The Spokane Branch of the Washington & Idaho, from Rockford to Spokane Falls, 27 miles, all in Spokane County, Wash. The Mullan Branch of the Washington & Idaho, from Tekoa, Whitman County, Wash., to a point east in the Territory of Idaho, 14 miles. There remains about 13 miles of track still to be laid to complete the Mullan Branch to the town of Mullan,

Idaho, and tracklaying is being actively pushed by J. H. Smith, the contractor, with a view of completing the line early this month.

Paducah & Mt. Vernon.—The company is to issue $2,000,000 six per cent. first-mortgage 40-year bonds, to provide funds for completing and improving the road.

Peninsular, Deer Park & Southern.—The road has been opened for traffic from Deer Park to Newberry, Ind. Albert Nichols, Michigan City, Ind., is General Passenger Agent.

Pennsylvania.—The Scottdale branch of the Pittsburgh Division has been opened for business from Mt. Pleasant, Pa., southward to Scottdale Branch Junction, Pa., a distance of five miles.

The contract for grading, bridging and tracklaying on the Little Sewickley Branch, from Radebaugh, Pa., nine miles to Arona, Pa., has been awarded to Charles F. King, of Shamokin, Pa.

Pennsylvania, Poughkeepsie & Boston.—Train service on this road was extended this week from Penn Argyl, Pa., to Slatington, Pa., 22 miles. The road is now being operated from Campbell Hall, N. Y., to Slatington, Pa., a distance of 95 miles, through Goshen, N. Y., Deckertown and Augusta, N. J., Portland and Penn Argyle to Slatington.

The survey for the Harrisburg extension has been completed through Berks County, Pa Four routes have been surveyed through the county, the most favorable being through Hamburg, thence along the Mill Creek Valley through Tilden Township to the village of Berne. From there it follows the line of the old South Mountain Road along the foot of the Blue Mountains. The old South Mountain is about three-fourths graded between Shartlesville and Harrisburg. S. G. Primrose, Goshen, N. Y., is Chief Engineer.

Pennsylvania & West Virginia.—The company has filed a charter in Pennsylvania for a line to extend from a point on the line of the Bedford & Bridgeport road near Mann's Choice, Bedford County, to Brook's Mills. The length of the road is to be about 35 miles The capital is $350,000. W. Bugbee Smith, Philadelphia, Pa., is President.

Richmond & Danville.—The annual meeting of the stockholders of this company was held last week. The gross earnings from traffic of the railroad proper, including the Baltimore, Chesapeake & Richmond Steamboat Line, for the nine months ended June 30, were $3,711,347, and for the three months ended Sept. 30, $1,253,053; total, $5,024,400. The operating expenses for the nine months were $2,230,687, and for the three months period $777,804; total, $3,008,491. The fixed charges, including rentals and taxes, were $1,548,936. The net earnings from traffic, $466,912; interest on investments, etc., $275,468; surplus, $742,381. Gross earnings of all the roads in the system, exclusive of the Georgia Pacific, operated under lease since Jan. 1 only, were for nine months, $7,443,884; three months, $2,563,396; total, $10,007,281. The expenses for nine months, $4,894,976; for three months, $1,716,416; total, $6,611,393; net earnings, $3,395,888.

Richmond & West Point Terminal.—The annual report was read at the stockholders' meeting, in Richmond, Dec. 10. It states that attention has been directed to unifying the railroad systems controlled, simplifying the classes of indebtedness, and securing a more harmonious management of the properties. The floating debt incurred in the purchase of the Georgia Pacific has been paid off; there has been acquired 7,134 shares of the stock of the Richmond & Danville; $3,429,000 worth of bonds of the Georgia Pacific have been taken up, and the company has acquired a sufficient number of shares of the East Tennessee, Virginia & Georgia giving practically a permanent control of that property. The President refers to the low capitalization of the properties. The average of the bonded debt and fixed charges, Nov. 30, 1889, with all leases capitalized on the basis of six per cent., is $19,606 per mile, and the average stock capitalization, including the terminal stock, is $16,320 per mile. The directors believe that the system can be so uniformed that its capitalization will not exceed $30,000 per mile in bonds and $12,500 per mile in stock, giving a total of $42,500 per mile on a system of 7,520 miles, which earned during the last fiscal year $28,294,461 gross, $9,836,806 net, and $1,959,780 above all charges. The cash income of the Terminal during the year exceeds the annual fixed charges by $533,806, and $134,550 will be added to this sum when the coupons on certain bonds accruing this year are paid.

St. Louis & Chicago.—The Purchasing Committee representing the second mortgage bondholders of the company, who bid in the line from Springfield, Ill., to Litchfield, a distance of 45 miles, at the sale on Oct. 4, have defaulted upon the payment of the $600,000 purchase money. There is a disagreement among the members of the committee, and it is probable that the line will revert to the first mortgage bondholders.

St. Louis & Illinois Central.—The company formally filed its articles of incorporation in Illinois. The line is described as to extend from Eureka, in the County of Woodford, in a southerly direction to Alhambra, in the County of Madison. The principal business office is to be at Springfield. The capital stock is $2,800,000, of which $1,300,000 is to be preferred stock, entitled to dividends of five per cent., and $1,500,000 is to be common stock.

Salt Lake & Fort Douglass.—This company is now operating the following lines in connection with the Salt Lake & Eastern: The main line from Salt Lake, Utah, southeastward to Park City, Utah, a distance of 35 miles; the Mill Creek branch, from Johnson's Junction, southward to Cottonwood, Utah, a distance of 23 miles; the Fort Douglass branch, from Johnson's Junction, southwestward to Wagner, Utah, a distance of nine miles; the Red Butte branch, from Fort Douglass, southward to Red Butte, Utah, a distance of seven miles.

San Francisco & North Pacific.—The Sonoma Valley division of the road is to be widened to standard gauge, and work will be commenced in a short time. The branch extends from Ignacio north to Glen Ellen, Cal., 26 miles.

Saskatchewan Railway & Mining Co.—This company is applying to the Dominion Parliament for power to extend its road from Saskatoon to a junction with the projected Hudson Bay road.

Savannah & Tybee.—This road, which extends from Savannah to Tybee Island, Ga., 18 miles, was sold at Savannah, Ga., last week, under order of the court, which fixed $100,000 as the minimum bid to be accepted.

Somerset.—The grading on the extension from Embden to Bingham, Me., 12 miles, is finished and tracklaying will be commenced in May. Trains are now running to Solon, 33½ miles, from Oakland, through Norridgewock, thence up the Kennebec River to Madison, Anson, North Anson and Embden. Bingham is 7½ miles beyond Solon. The maximum grade on the extension is 75 ft. per 100 ft., and the maximum curves are five degrees. W. M. Aver, of Oakland, is Superintendent.

Spokane Falls & Northern.—Tracklaying on this road began at Spokane Falls, Wash., June 1, and was suspended at a point nine miles north of Colville, on Dec. 1. The total number of miles laid during the year was 98.

The company is applying for a charter in Canada to construct a road from a point on Kettle River, near the boundary line of British Columbia, thence by way of Rock Creek and Osoyoos Lake to the Fraser River, near its mouth. It is also proposed to build from a point near the mouth of the Pen d'Oreille River, to the town of Nelson, on Kootenay Lake. E. J. Roberts, of Spokane Falls, is Chief Engineer.

Texas Western.—This road, extending from Houston to Sealey, Tex., 53 miles, which was bought in at foreclosure sale last May by Elijah Smith, of New York, was only taken out of the control of the receiver last week. John H. Gray has been appointed General Manager.

Toledo, Findlay & Springfield.—Tracklaying is progressing on this road between Bowling Green and North Baltimore, Ohio, 15 miles, and it will be opened between these points Dec. 16. W. W. Harring, of Toledo, is Superintendent.

Trenton Cut-off.—This company has been incorporated in Pennsylvania to construct a line from a point on the dividing line of Montg mery and Bucks counties, Pa., in Southampton Township, to Morrisville, a distance of 16 miles. J. N. Du Barry of Philadelphia, is President.

A charter has been granted in Pennsylvania to this company, which proposes to construct a road from a point in Southampton Township, Bucks County, at the Montgomery County dividing line, to Morrisville, opposite Trenton, a distance of 16 miles. The capital is $1,000,000.

West Florida & Alabama.—A small force of men is now working on this road at Chipley, Fla., but the number will be materially increased in a short time. It is intended to complete at once the 40 miles between Chipley and St. Andrews Bay, of which 30 miles was graded some time ago. The road is to extend from St. Andrews to Chipley and Geneva, Ala., and thence toward Montgomery. The work is very light, and there will only be a small amount of trestling between Chipley and St. Andrews. B. F. Howland, 18 Broadway, New York City, is Vice-President, and J. M. Withrow, of Chipley, is Chief Engineer.

Wheeling & Lake Erie.—The eastern terminus of the extension now building has not yet been decided, and surveyors are still working in eastern Ohio and have run a line from Adena, in Jefferson County, through Maynard and St. Clairsville to Bellaire, which is said to give the desired connections with both Steubenville and Bellaire and passes through a country with good local trade.

TRAFFIC.

Traffic Notes.

On Dec. 4 steamship charters were contracted for at Baltimore for grain to Europe to the amount of 650,000 bushels.

The Pennsylvania lines west of Pittsburgh announce that the sale of one-way party tickets at the rate of two cents per mile will be resumed on Dec. 14.

The Pennsylvania has reduced its passenger fares from Pittsburgh to Washington and Baltimore, to meet the reduction of $1 made by the Baltimore & Ohio.

The receipts of wheat at Duluth for the month of November aggregate 9,435 cars. The shipments were 4,528,500 bushels, and for three months 10,900,000 bushels.

A Cleveland paper announces that ticket brokers in that city have large supplies of tickets to New York over the Erie and Lackawanna lines, which they are selling at 89 each.

The Chicago, Burlington & Quincy has made a single contract for carrying 8,000 carloads of grain from Kansas and Nebraska, which are to go to the Atlantic seaboard over the Vandalia line.

The United States Court for the Northern Division of the Eastern District of Missouri has fined Geo. K. Frazer, agent of the Missouri Pacific, $500 for discrimination against the Hayward Grocer Company, but a stay of execution was granted. This is the famous case in which a jury decided that the difference between a local rate and a proportion of a through rate must be small.

The war between the Interoceanic and Mexican Railways continues. Both lines have reduced rates, but shippers and travelers, remembering the high rates of the Mexican Railway, now favor the Interoceanic, and its travel and freight exceed by 50 per cent. that of ordinary times, and the company has not enough rolling stock to supply the demand for transportation.

At a meeting of the Western Freight Association in Chicago, Dec. 11, the Chicago & Alton gave notice of its intention to reduce the rate on cattle to the basis of 18 cents from Kansas City to Chicago, to take effect Dec. 21. It also announced that at the next meeting it would give notice of a further reduction in the rate to 12½ cents. The cause assigned for this action is that other roads have been secretly cutting the rates.

The Kansas Railroad Commissioners have ordered that the rates on salt from Kingman, Anthony and Wellington shall be the same to Missouri River points as from Hutchinson, Nickerson and Sterling. The Board says: "We are of opinion that the salt tariffs to local points need revision, in the interest of justice to all those concerned. But this involves so many adjustments, not only as it respects the salt interests, but as well those that concern the carriers, that its final consideration will be entered upon at another time, and upon further notice to parties in interest."

The Pittsburgh papers report the scarcity of coke cars as slightly relieved. Over 30,000 tons of coke are now shipped daily.

The freight car famine at Kansas City is growing worse rather than better. On Tuesday 700 cars were waiting in that city. One cause of the local blockade is claimed to be the delay occasioned by the enforcement of the new Grain Inspection law. The inspecting force is incompetent or insufficient. The Railroad Commissioners of Kansas receive scores of complaints from grain shippers that they have been obliged to pile up their corn along the railroad tracks. Some of the roads have even resorted to boarding up flat and coal cars for the shipment of grain.

The variety which affords the strong meat as well as the spice of traffic men's life at Chicago shows no sign of diminution, as appears from the following item:

At the meeting of the Western Freight Association, held at Chicago, Dec. 11, the following subjects were to be considered: Application of same rates on oak lumber as on birch, maple and other native hard woods; bedding for stock cars; proposed amendment to Sec. 6 of Art. 1 of the agreement; abolition of car lot charges on live stock; mixed shipments of fresh and salt meats; transportation of men in charge of live stock; payment of shippers' telegrams; rates on dead hogs; readjustment of Peoria differentials; ice furnished for refrigerator cars; proposition for the establishment of a "Railway Tariff Exchange;" issuance of free transportation to representatives of fast freight lines.

The Interstate Commerce Commission.

The New York Board of Trade and Transportation has entered a complaint against the Pennsylvania and its controlled lines carrying freight to Chicago and St. Louis, alleging unjust discrimination in rates on traffic for the West which is received from Europe on through bills of lading, the railroad share of the charges on such freight from the Atlantic seaboard westward being much smaller than the regular tariff charges, thereby discriminating against shippers in New York, Philadelphia and vicinity. It is alleged that the defendants fail to publish or to state in through bills of lading the inland charge separately; that the Pennsylvania is interested in steamship lines and therefore practices this unjust discrimination in such a way as to make it difficult to get at the facts.

Nebraska and Kansas Rates.

The managers of the Nebraska and Kansas lines were in session nearly all last week in Chicago for the purpose of adjusting the relation between the through and local rates west of the Missouri River, in the states of Nebraska and Kansas, but in spite of the most strenuous efforts made to reach an agreement a conclusion could not be reached, and the matter was referred to the Board of Managers of the Inter-state Commerce Railway Association. As a last resort the Rock Island proposed that the question be again submitted to the special board of arbitration, and that the rates recommended by the arbitrators be put in effect for at least 60 days. The proposition, however, was voted down. The Nebraska roads claimed that they were pledged to put reduced rates in effect from Omaha, Lincoln and Beatrice to Nebraka local points, and they could not violate that pledge. The compromise tariff proposed by the Kansas lines they did not consider satisfactory, and consequently all that they would consent to was to hold their proposed new tariff—which was to have gone into effect Dec. 10—in abeyance until after the meeting of the board.

On Wednesday, Dec. 11, the Board of Managers referred the question back to the Special Board of Arbitrators. The Missouri Pacific and Burlington & Missouri River roads had put into effect on Dec. 10 their Nebraska basis of rates, putting Lincoln and Omaha on an equality, but agreed to suspend the tariff until final action was taken by the general managers.

A Shippers' Manifesto.

The freight bureau recently organized by the Kansas City Commercial Club has formulated a "platform" setting forth the reasons for its existence, from which the subjoined paragraphs are taken:

"To give transportation companies such information regarding the various lines of goods it represents as shall insure their proper classification; to secure freight rates . . . which shall not discriminate against Kansas City; to assist in adjusting claims of whatsoever nature, and to render its services to members in all matters pertaining to the transportation of merchandise and the extension of the trade of Kansas City, Mo.

"This organization is not for the purpose of antagonizing transportation companies, but will act on the theory that the railroad managers will redress the grievances of their patrons when properly laid before them, in the same manner that other good business men will redress the grievances of their customers.

"We feel . . . that by united effort more can be accomplished than if presented by individual firms.

"The Inter-state Commerce law does not provide against the endless variety of discriminations that may be practiced, which are sources of hardship to the shipping interests of this city. From the fact that committees to present matters to transportation companies are usually composed of busy merchants, who, if the point at issue is not speedily settled, cannot spare the time to continue their efforts and soon either abandon the field or compromise on anything that is no concession, while a bureau is ready at all times to push matters to a termination, this bureau is organized."

East-bound Shipments.

The shipments of east-bound freight from Chicago by all lines for the week ending Saturday, Dec. 7, amounted to 80,435 tons, against 69,633 tons during the preceding week, an increase of 10,802 tons, and against 93,391 tons during the corresponding week of 1888, a decrease of 12,956 tons. The proportions carried by each road were:

	W'k to Dec. 7.		W'k to Nov. 30.	
	Tons.	P. c.	Tons.	P. c.
Michigan Central	9,998	12.4	10,504	15.1
Wabash	4,552	5.7	3,156	4.5
Lake Shore & Michigan South.	15,101	18.8	12,638	18.1
Pitts., Ft. Wayne & Chicago	10,652	13.2	7,743	11.1
Chicago, St. Louis & Pitts.	8,778	10.9	7,445	10.6
Baltimore & Ohio	8,448	10.4	6,011	8.6
Chicago & Grand Trunk	11,026	13.8	8,542	12.2
New York, Chic. & St. Louis	6,190	7.8	5,692	7.6
Chicago & Atlantic	5,650	7.0	8,502	12.2
Total	80,435	100.0	69,633	100.0

Of the above shipments 4,502 tons were flour, 36,856 tons grain, 2,646 tons millstuffs, 8,049 tons cured meats, 5,213 tons lard, 9,543 tons dressed beef, 1,087 tons butter, 1,505 tons hides, 230 tons wool and 4,648 tons lumber. The three Vanderbilt lines together carried 39 per cent., while the two Pennsylvania lines carried 24.1 per cent.